THE
ELECTRICAL REVIEW

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Electricity in Wartime

Less for Home : More for Industry

WAR conditions inevitably call for a drastic revision of peace-time ideas in a great many directions, and one of the most important of these is electricity supply.

For many years we have preached the gospel of more and more electricity for all purposes in industry and in the home, and we may claim with all due modesty that we have contributed much to the present satisfactory state of electrification in this country.

Now we have reached a position in which this advocacy of all-round development has to be looked at from a different point of view. The institution of a scheme for rationing the consumption of electricity in the home and the less-important industrial and commercial establishments means a postponement of domestic development.

That is not to say that the output of electricity is likely to be reduced. The demands of industry, intensified by the greater activity which will accompany the production of present-day necessities, must continue to grow. Industrial electrification connotes increased efficiency and consequently there must be no slackening in this respect.

Substantial Saving

What it amounts to is that the saving accruing from the smaller domestic demand will provide a surplus for industry. And the surplus will be a very substantial one in view of the degree of home electrification which has been reached in this country. In the latest "Engineering and Financial Statistics" published by the Electricity Commissioners, covering the year 1937-38, it was shown that of the total sales by all authorised undertakings, amounting to 19,262.8 million kWh, 7,348.5 million, or 38.1 per cent., was for lighting, heating and cooking, and 341.1 million (1.8 per cent.) for public lighting. Something over half (54.1 per cent.) was sold for power purposes. On this basis rationing to 75 per cent. would mean a potential saving of 1,837.1 million kWh to which would be added the quota due to reduced public lighting.

It is not yet clear whether supply undertakings will be permitted to connect up new domestic consumers who already have alternative supplies of fuel, nor what is to happen in the case of recently connected householders who have no basis for electricity rationing, *i.e.*, were not on the mains during the year ended June 30th last. We cannot think that further domestic development will be held up indefinitely, although we realise that more urgent considerations may cause delay. No doubt the newer consumers will be treated as special cases and a reasonable allowance made to them. This will be for the local fuel committees to decide in conjunction with the electricity supply authorities who will be represented thereon.

Another question which crops up relates to those houses in "safe" areas which have had women and children from other districts billeted upon them. It would be manifestly unfair to cut down these householders' fuel allowance. Probably the point could be settled by arriving at a per capita average and adding this for each of the newcomers.

Possible Economies

We are now called up to to do the most we can with the reduced supply permitted us. Those who are merely users of electric light will find that the "black-out" requirements will automatically limit their consumption. On the other hand, occupiers of all-electric houses will not be so favourably placed. They will certainly save a good deal on their lighting, but this, as a rule, is but a small proportion of their total consumption.

It is (perhaps unfortunately now) so easy to switch electricity on and off that actual waste has generally been avoided. In fact, this is one of the main arguments in favour of electricity. But no doubt most of us have not been too parsimonious in our use. We have let our fires burn longer than was strictly necessary; we have used our ovens when a hot-plate might have done the job; we have very often over-filled our kettles; and water-heaters have been left running during the day and night under the care of thermostatic control.

In these matters we shall have to exercise a little more care and no doubt will thus be able to carry on with the minimum of inconvenience. Those who have already been excessively careful will perhaps feel the restriction more, although they should not be unhappy at the opportunity of saving still more.

There is accordingly little hardship involved in rationing, once special cases have received consideration, and we can hope that it will be possible to maintain the supply at the new level until peace reigns again and we can continue our expansion.

I.E.E. Register

As the first professional body, we believe, to produce a National Service Register of its own, the Institution of Electrical Engineers is desirous of completing the scheme as early as possible. Last week we referred to the Register as a valuable means of ensuring that the experience of electrical men was used to best advantage during the war, which would generally mean that they should put in more time and effort than ever before on their present jobs. Any modification in individual cases would be made only on the recommendation of a sub-committee of electrical engineers, which is advising the Ministry of Labour, and then only if work of greater national importance made it necessary. In any event, nothing would be done without consultation with a man's employer. Those who for some reason or other do not feel themselves free to offer their services in the manner suggested should nevertheless fill in the red form with particulars of their experience, as this is intended only as a very useful addition to the records of the Institution itself.

An Urgent Need

THE present grave situation has decided the British Red Cross Society and the Order of St. John of Jerusalem to co-operate as they did during the last war. Accordingly a Joint Emergency Committee has been set up with Lord Cromer as chairman and Major-General Sir John Kennedy as vice-chairman. The task of the joint organisation is unfortunately much heavier than it was before. In addition to attending to the welfare of sick and wounded members of the Forces it will be called upon to aid millions of civilians who will suffer in the conflict. From 1914-1918 a total of £17,000,000 was expended on the organisation's great humanitarian work, which is performed by voluntary service, and it now appeals for the necessary money to enable it to deal adequately with the calls which will now be made on it. A fund has been opened and all who can are asked to send what they can to the Hon. Sir William H. Goschen, K.B.E., Honorary Treasurer, Red Cross & St. John Fund, at Messrs. Coutts & Co., 1, Park Lane, London, W.1.

Important T.V.A. Acquisition

THE sale of the properties of the Tennessee Electric Power Co. to the Tennessee Valley Authority brings to an end five years of somewhat bitter controversy and litigation. As Mr. Willkie, the chairman of the parent company, stated, the result is a victory for public ownership against private enterprise. He maintained that the Federal Government had acquired "one of the best electrical services in the world" at about four-fifths of its real value. He did not view the future with optimism as he considered that any reduction in the charges for service would be counterbalanced by the extra taxation which the loss of the company's contribution would involve. This is one of the principal arguments used against public ownership by the American utility companies. While it is difficult to assess its validity it is true that the people in a public-ownership area are subsidised to some extent by the nation as a whole which has to provide the amount formerly paid as Federal taxation by the dispossessed company. Only complete public ownership, of course, could spread the burden equally. The total sum involved in the transaction, including the acquisition of other local undertakings, was $78,600,000, and the stockholders of the Tennessee Company seem to have done well.

Readers are earnestly requested to instruct their local newsagents to reserve a copy of the ELECTRICAL REVIEW for them regularly in order to facilitate distribution arrangements and avoid the risk of failure to obtain copies.

In the interests of the paper itself in these difficult times it is particularly hoped that regular purchase will be made from the same newsagent or bookstall each week. To assist readers an order form is provided on page 60 of our advertisement section.

Government Joint Committees

A COMMENDABLE example of the way in which administrative departments can make the best use of the electrical industry's experience is to be found in the work of the committee set up by the Home Office A.R.P. Department jointly with the Illuminating Engineering Society. The conclusions of this committee have thus the authority of the Home Office behind them, and can be put into effect with essential promptitude. The channel used is the British Standards Institution, and during the last two weeks we have shown fruits of this co-operation in the particulars of new British Standard Specifications relating to emergency lighting. It is a fortunate coincidence that Mr. Percy Good, deputy director of the B.S.I., is also this year's president of the I.E.S., and that the offices of the two bodies are almost adjacent. The principle of close working with a technical society that has been adopted by the Home Office in this case might itself be looked upon as a British Standard.

Purchasers' Moves

FROM information which reaches this office from many quarters, it is apparent that a remarkable redistribution of buying capacity has taken place, which is, no doubt, due mainly to evacuation from some centres and increase in population in others. This is particularly noticeable in the domestic market where local stocks have had to be replenished to meet demands in areas which have hitherto been backward. In some cases, large firms have moved their headquarters to large country houses, which may need a great deal of electrical equipment to cope with the new situation. In others, existing works in "safe" areas are being called upon to add considerably to their output, which again often means more electrical plant. This redistribution in buying capacity is a matter which calls for the special consideration of both manufacturers and distributors.

Trams Reinstated

We have long advocated that electric traction should be retained for public transport as a means of minimising our dependence upon imported fuel. The wisdom of this course is emphasised by the present state of affairs, and some local transport authorities have had to reconsider their decision to abandon tramways in favour of oil-engined buses. At last week's meeting of the Manchester City Council, it was urged that no further trams should be taken out of service, and that those which had been removed should be reconditioned and restored. The chairman of the Transport Committee gave an assurance that the suggestion would be thoroughly considered. At Liverpool it has been decided to restore to its original length a tramway service which had been considerably reduced, and at Darwen, trams which were withdrawn at the beginning of the year are again in operation. We shall, no doubt, hear of other authorities deciding to take similar steps.

Our Domestic Issue

OUR annual review of domestic equipment development will appear as usual, on October 6th. Although the electrification of the home may be slowed up, we feel that readers should be kept acquainted with trends in design and construction of domestic apparatus in preparation for better times. Moreover, there are many problems of domestic electrification peculiar to wartime conditions, which will be discussed in this issue.

WORKS SUPPLY SCHEME

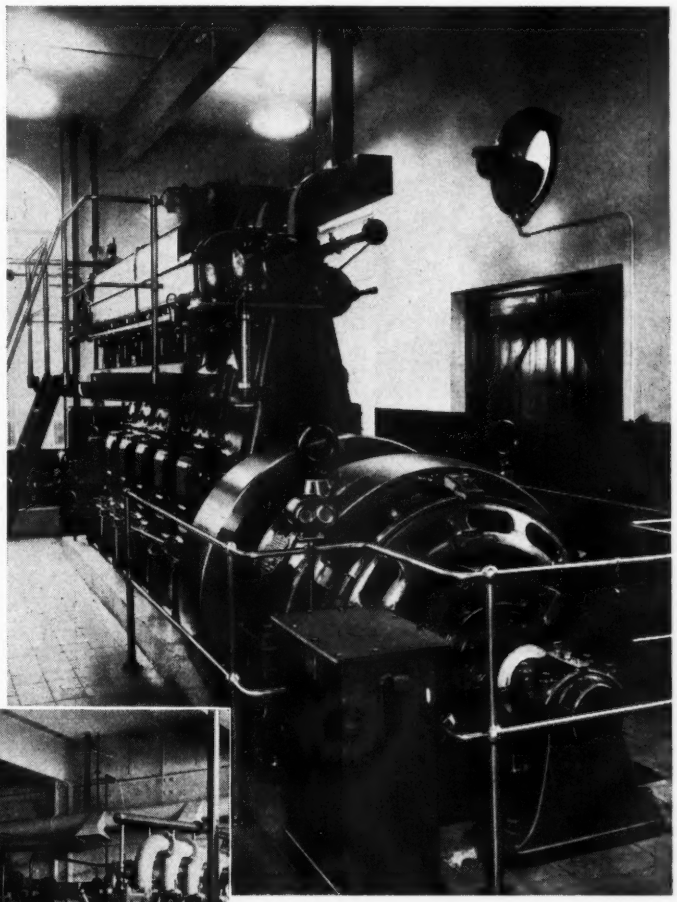
Parallel Running Arrangement

Advantages to both the public supply undertaking and to the consumer are afforded by the combined schemes of public supply and private generation adopted by an electrical manufacturing concern

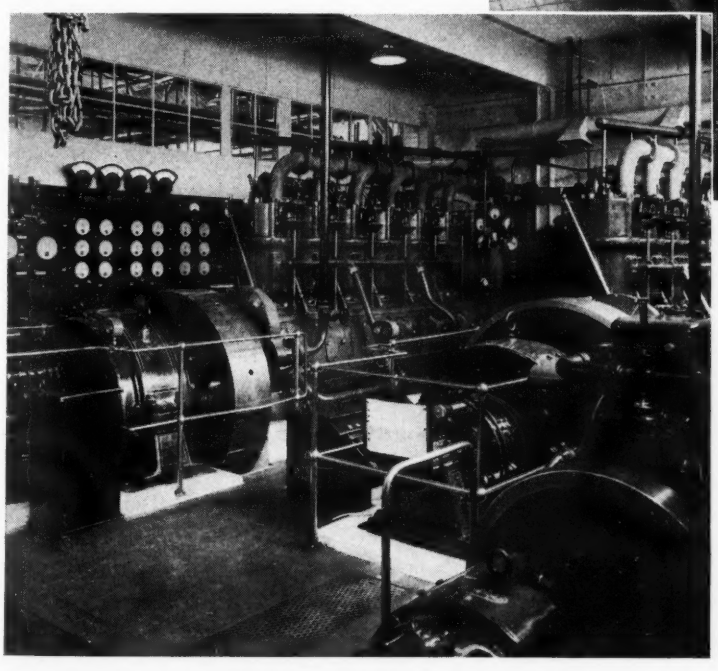
PEAK-LOAD difficulties have always been a handicap in public supply work, and although the effects of the advantages of co-ordination of public supply generation by the operation of the national grid system may in the long run largely eliminate the difficulties, for the moment these are more apparent to many undertakings because of the emphasis given to the problem on the bulk supply charges account.

Although we do not intend to discuss in this article the relative merits of private generation and public supply, it is a fact that on some of the larger networks in the country, particularly those serving collieries, there are many instances where the private generating plants of individual industrial consumers run in parallel with the public supply system with acknowledged advantages to both sides. Outside such areas, however, the combined scheme is seldom encountered, and the system now in vogue at the factory of Venner Time Switches, Ltd., is therefore of particular interest.

When the factory was first established a few years ago private generation only was adopted, but the recent addition of public supply to the scheme and the consequent running of the private generating and public supply systems in parallel may be regarded as the logical development of the system, which has been brought about as the result of the natural growth of the manufacturing concern. Considerable "levelling-out" of the local public supply peaks has been a direct result. To consider the scheme under the two headings—private generation and public supply—there are a power station, with 505 kW of DC generating plant, and a new substation at which a supply is taken at 11,000 V and in which 600 kW of motor-generator plant converts the bulk of this to DC for supply to the factory separately or in conjunction with the supply from the works power station under parallel running operation.



250-kW Belliss & Morcom-Lancashire Dynamo Diesel-electric set



Power station showing the two Ruston-English Electric Diesel generators and main switchboard

In the power station there are three main generating sets, including a 225-HP, six-cylinder, 375-RPM Ruston Diesel engine coupled to a 150-kW, 400-V English Electric generator; a 150-HP, four-cylinder Diesel engine of the same make serving a 100-kW English Electric generator of the same speed and voltage; and a five-cylinder Belliss & Morcom airless-injection Diesel engine driving a 250-kW, 400-V Lancashire Dynamo DC generator. The last-mentioned set was installed more recently, and in consequence of its more modern design the two older sets were modified to give the installation as a whole a more uniform character by introducing some of the newer features of the largest equipment. Generally, then, it will be sufficient, so far as the details of the engines are concerned, to refer to some of the newer features of the 250-kW set.

Compressed air for starting the B. & M. set is provided by a Hamworthy petrol-paraffin compressor set that is interconnected with a similar compressor set, which serves the two smaller engines. The receiver for the compressor is outside the power station. All three engines are run on crude petroleum, which is stored in three horizontal cylindrical tanks outside the power station. From these tanks the oil is pumped *via* a De Laval centrifugal cleaning plant to a purified-fuel tank on the roof, and from this roof tank the oil flows by gravity to the service tanks in the power station. For each of the service fuel tanks there is an electrical level indicator inside the power house. The centrifugal cleaner is switched off automatically when full level is reached during pumping operations.

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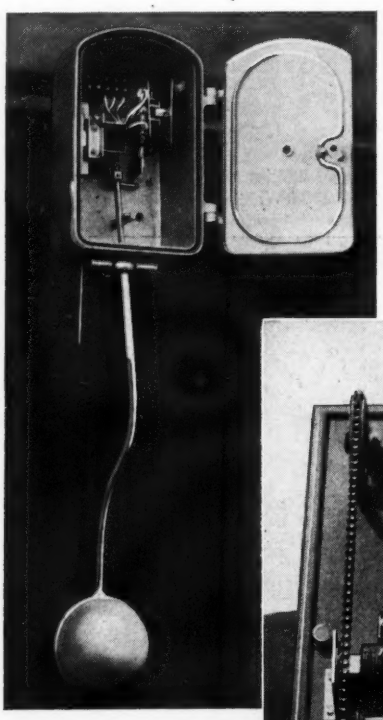
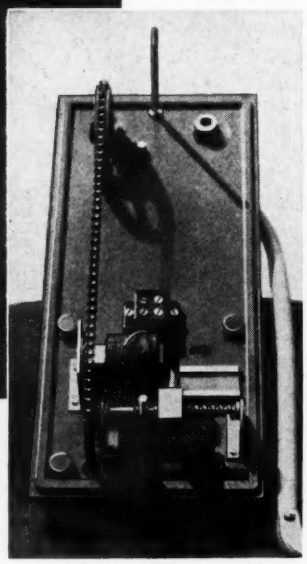
For the engine cooling there is a cooling tower and pond on the roof of the power station, and the water is circulated around the cylinder jackets by means of pumps incorporated in the engines and driven from the main crankshafts. In connection with the latest set, however, an electrically driven water pump has been installed as a stand-by. Floats on the cooling pond operate in conjunction with remote electrical indicators in the power house.

Wide load variations result normally in considerable temperature differences in the cooling water in the jackets, but in order to maintain a reasonably constant temperature to give the most efficient engine working, arrangements have been made in the water circuit so that some of the hot water from the engine may be by-passed for recirculation round the engine when required, thus decreasing cylinder wear and reducing fuel consumption.





Cooling-pond water-level indicator actuator gear and alarm switch and (below) actuator for fuel-oil level indicators

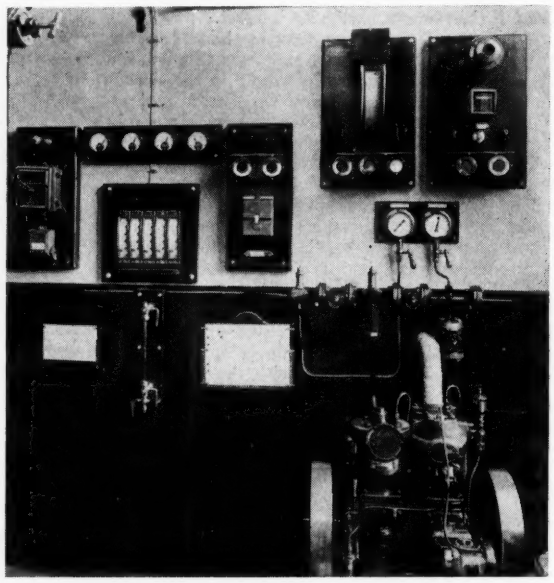
There is a separate cooling tank for the Hamworthy compressor set, and this is also equipped with a water-level indicator. A "Stream-line" lubricating-oil filter serves each of the main engines and is supplied with hot water by means of a heater built round the exhaust pipe of the engines and arranged in the water circuit. The water for this purpose is taken from, and returned to, the cooling-tower pond.

A fourth generating set in the power station is a single-cylinder Lister engine driving a 5-kW, 200-V, DC generator, and this operates in conjunction with a lighting battery serving emergency lighting in the event of failure of the main plant, and is arranged to start up automatically. Another battery serves for the switchgear operation, and each of these two batteries has its own booster.

The main feeder and operating board in the station was built almost entirely by Venners, and comprises "Sindanyo" panels with Elliott & Nalder instruments and Venner automatic devices. Everything for the whole electrical scheme—*i.e.*, both private generation and public supply—is controlled from this switchboard. Panels for controlling the public supply sub-station contain push buttons and indicating lamps for all the switchgear and repeater instruments. The push buttons are duplicated in the sub-station so as to afford local control if necessary.

Panels for the three Diesel-engine generators are also incorporated in this switchboard, as are also the panels for the batteries for switchgear operation and emergency lighting already referred to. All the feeders to various parts of the factory are controlled and metered on separate panels, one of which is equipped with an earth-leakage indicator and trip gear. The lighting feeders are also separately controlled and metered, each feeder being so arranged that by means of a change-over switch it can be connected either to the main DC busbars or to auxiliary bars which are energised from the AC supply. This, said Mr. S. J. Matthews, works manager, to whom we are indebted for his co-operation in preparing these notes, helps in the event of a breakdown and when equalising loads.

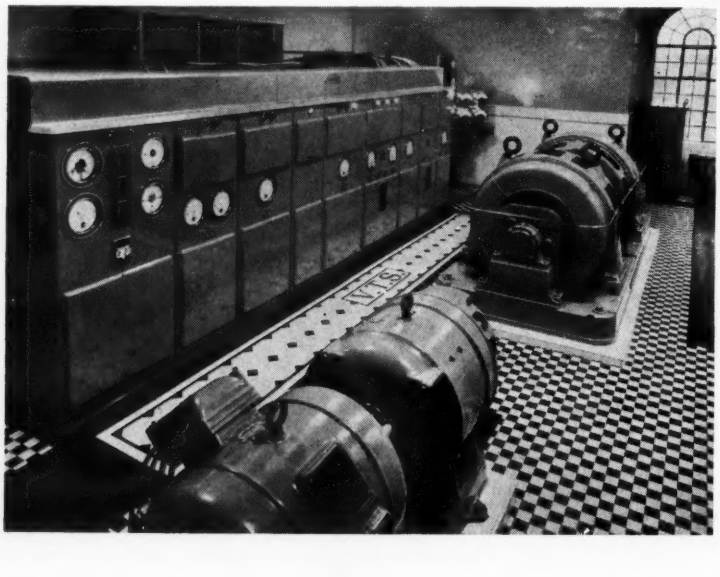
A separate panel for controlling the AC incoming feeder from the sub-station also controls the 400/230-V transformer, the secondary of which also has its own panel. The 400-V and 230-V AC supplies are used mainly for testing the company's products. Finally, there is a panel which controls the whole of the power station auxiliaries. The power for these is metered so that it may be charged to the cost of running the station.



Air-compressor for Diesel starting and control gear water pump and purified fuel pump

Public Supply Sub-station

The sub-station is housed in a separate brick building, which is coupled to the power station by a steel gantry carrying the cables between the busbars in the power station and those in the sub-station and the remote control cables. The sub-station DC busbars are considered as an extension of the power station bars. The public supply is received at 11,000 V, the incoming cable terminating in two Reyrolle switches in a special room provided for the use of the public supply authority. At this pressure it is first controlled by a Ferranti



Public supply sub-station showing the two motor-generator sets and the main switchboard

moving-coil voltage regulator situated outside the sub-station with an 820-kVA, 11-kV/400-V Hackbridge transformer. This is controlled on the high-voltage side by a Reyrolle ironclad circuit-breaker connected directly to those mentioned above by busbars in a sealing chamber through the wall separating the main sub-station from the supply authority's switch-room.

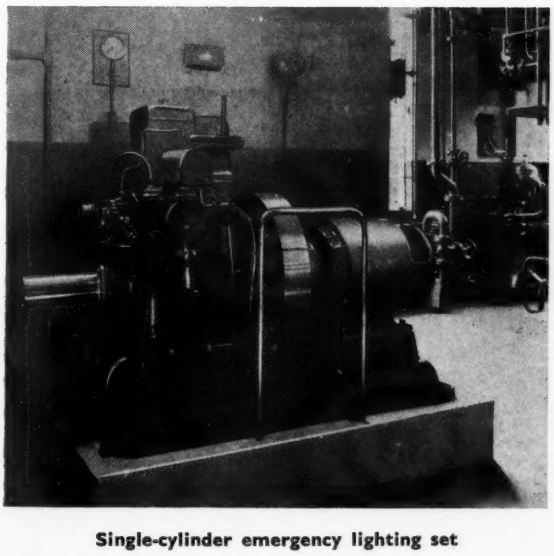
Some of the 400-VAC supply, which is centre tapped, is passed on to the auxiliary busbars, but the bulk of it is taken by the motor generator plant in the sub-station. There are two motor-generator sets, one with a 720-HP motor driving a 500-kW, 400-V, DC, three-wire generator and a 100-kW set for light-load work. Both of these sets were supplied by Lancashire Dynamo & Crypto, Ltd., and the driving motors are both of the capacitor type, the larger machine being, it is believed, the largest motor of its kind (single-phase) to be produced in this country.

The switchboard in the sub-station is unusual and impressive. It is totally enclosed, with access doors at either end and at the back, and is a dead-front structure with a "live front" back—that is to say, the contactors are arranged at the back as they normally would be on a live-front board.

The switchboard was manufactured by Brookhirst Switchgear, Ltd., and its instruments were supplied by Nalder Bros. & Thompson, Ltd. The board has nine panels, the first of which (left) contains a kVA indicator, which has an alarm for indicating the peak load, a kW meter, voltmeter, power-factor meter, and three Reyrolle protective relays for the transformer.

The second panel serves the 400-V AC outgoing feeder to the power station. The next three panels accommodate the starting equipment for the two motors of the motor-generator sets, while panel 6, which has a recording kWH meter by Landis & Gyr, serves for the motor of the 100-kW set. Panels 7, 8, and 9 contain the DC equipment for the 500-kW set. At the end of the switchboard a swinging gate carries the busbar and paralleling voltmeters. On this board there are indicating lamps, and in addition to the ordinary red and green "on" and "off" signals there is an amber lamp, which indicates the exact moment when the machine is ready for paralleling.

The whole of the switchgear is electrically interlocked, making it impossible to close the contactors in an incorrect sequence. The push-buttons for local control of the motor-generator sets, duplicating those in the power station for remote control of the sub-station plant, are arranged on the front of the board.



Single-cylinder emergency lighting set

A charge engineer's office is pleasantly isolated from the power station and sub-station, and is equipped with a comprehensive apparatus for the remote indication of conditions in the two stations, also for testing water, fuel and lubricating oils. The complete system was designed by Mr. Matthews, who received valuable co-operation and help from the chief engineer of the public supply undertaking and members of his staff.

The main contractors for the sub-station were Lancashire Dynamo & Crypto, Ltd., whose engineer, Mr. H. F. Buxton, also rendered valuable help in the layout of the plant.

Contactor gear at the back of the sub-station switchboard

We are indebted to Venner Time Switches, Ltd., for permission to visit their premises to obtain the necessary material for this article.

Large American Power Deal

ON August 15th the property of the Tennessee Electric Power Co. (a subsidiary of the Commonwealth & Southern Corporation), together with the electrical undertakings of over 30 municipalities and rural co-operatives, was transferred to the Tennessee Valley Authority. A total of $78,600,000 was paid by the T.V.A.

Reporting the transaction, the *Edison Electric Institute Bulletin* for August says that the sale represented at least a partial victory for public ownership protagonists, backed by the strength of the Federal Administration, at the same time marking a personal triumph for Mr. Wendell L. Willkie, President of the Commonwealth and Southern Corporation, in securing a price that enables the parent company to make full payment on all bonds and preferred stock, and partial payment on common stock.

In a later statement Mr. Willkie declared that the Federal Government had acquired, at about 80 per cent. of its real value, one of the "best electrical services in the world."

"Whether or not the quality of service is maintained, these customers will, of course, enjoy the lower rates made possible by Government subsidy—but they and all the people in the United States will pay the higher taxes which tax exempt and heavily subsidised Government operations inevitably require.

"But the loss of these properties will not be in vain if it serves to arouse the American people against Government invasion of their business. In looking to the future, I plead with the Government for two principles, both of which are essential if the system of free economic enterprise is to be preserved. I ask first, as I have asked many times before, that the Government discontinue its competition with private business outside the Tennessee Valley. It now has its 'yard-stick' area. It should be content with that, so that in other areas of this nation the utility industry may make its vital contribution to American business recovery.

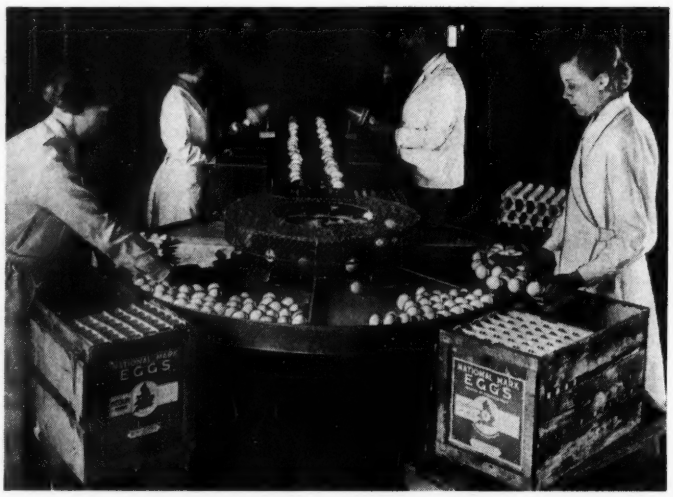
"Second, I ask that these Government agencies should keep their books on a completely honest basis, so as not to mislead the American people, from whom these commissions get their power. Not only should these agencies observe the rules laid down by the Government for the utilities themselves, but they should make due allowance for such things as the tax income loss to the Federal and local Governments whenever a private enterprise is destroyed."

EGG STORAGE

A Useful Load with a High Load Factor

THE use of electricity for long-period storage of eggs is a relatively recent development and a very modern installation claimed to be the only one of its kind in this country—is that of the Chelmsford Egg Supply Co. (1934), Ltd., in the County of London Electric Supply Co.'s area. Taking us round the factory recently, Mr. H. W. J. Cohen assured us that the system used enables eggs to be kept fresh for an indefinite period—for years if need be—as no bacteriological reaction can take place under storage.

If eggs are frozen below 28 deg. F. they crack, so that storage by freezing is impracticable. Storage in gas, in the same way as apples, is better but it takes time for the gas to percolate through the shell. To overcome this difficulty the company has introduced an entirely new method. Every egg has a small air space at the top. This grows as the egg ages and by means of a pump the air is extracted and carbon dioxide and nitrogen inserted under a pressure of 250 mm., this pressure being held all the time the eggs are in storage.



Grading eggs at the National Mark packing station, Bishop's Stortford

The eggs are stored in nineteen large cylinders each holding 234,000 eggs and are kept at a temperature of 30 deg. F. The refrigerating unit is driven by a 6-HP motor, additional 5-HP and 2.75-HP motors being employed for circulating the water and ammonia. The effect of the cold is to check the growth of the egg while the gas is a sterilising agent. The gas-tight cylinders in which the eggs are stored have the appearance of large boilers and are situated in a cold room in banks of seven. An additional chamber held at a much lower temperature is used for freezing liquid eggs (the product of cracked eggs) which are sold to the local bakeries.

Although the unusual system employed makes the storage system the most interesting aspect of the installation, the factory is also a National Mark packing station capable of dealing with a million-and-a-half eggs a week. The process in the packing station involves egg testing, grading and packing. Four large graders, each with two candling lamps, are in almost constant use. An expert candler can test 1,500 eggs an hour, detecting in a moment a stale egg, blood specks or one with enlarged pores which will not keep. This grading work, which consists of feeding the grader and afterwards packing the eggs, is a monotonous job so the company has found it beneficial to provide music for the employees.

An egg washing machine is also installed but Mr. Cohen has strong views as to its use as a washed egg will not keep nearly so long as an unwashed egg. So marked is the difference that he never submits a washed egg to his storage process. The washing opens the pores and removes the "bloom" of calcium which is always to be found on a newly laid egg and this in turn hastens evaporation and development, as well as making it more easy for germs to enter the egg. Neither can the washing remove any germs which may have already entered the egg before cleaning. Mr. Cohen goes so far as to declare that no washed egg should be certified as Grade "A" and points out that the Danish Government deprecates strongly the export of washed eggs. However, there are always some farmers who send in dirty eggs and so the washer is installed and used.

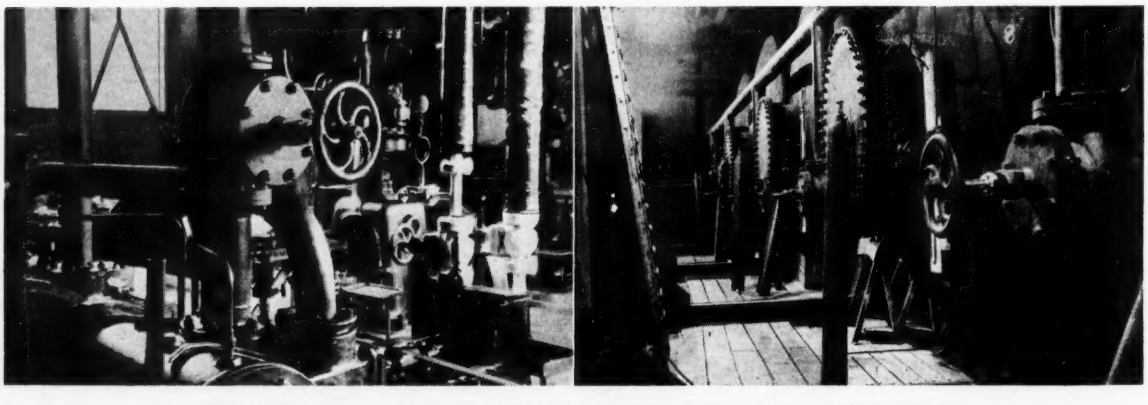
It might be thought that the electrical load of such an installation is only a small one, but this is far from being the case for during May alone 8,400 kWh of electricity was used and the last full year's consumption was 59,303 kWh. Of advantage to the supply undertaking is the excellent load factor and the fact that the heaviest consumption is during summer months.

We found the same aversion to the washing of eggs at Mr. Lacey's National Mark egg packing station at Bishop's Stortford in the Northmet Power Co.'s area. The eggs here are collected from sixty or seventy neighbouring farms and about 60,000 eggs per week are candled, graded into three qualities and packed, every egg of each grade being automatically recorded on counters fitted to the egg grader which is capable of dealing with 6,000 eggs per hour.

Generally rejected eggs number about four in thirty dozen or a little over 1 per cent. When necessary the eggs are washed in an electrically operated washing machine but experiments at the station have shown that eggs that must be cleaned store best is treated with a fine abrasive such as "Vim" in place of washing, as instead of opening the pores it seals them.

However, in these days of extensive battery brooding the necessity for cleaning does not arise so often as it did. It was not possible to obtain the consumption figures at this station because an electric incubator and hatcher is connected to the same meter, but it involves an almost continuous day load of about 500 W.

Egg storage, in particular, offers a useful load and if an attractive tariff is available, is an economical proposition, the seasonal differences in the price of eggs more than making up for the cost of storage.



The engine room and storage tanks at the egg storage installation at Chelmsford

FARM ELECTRIFICATION

Recent Trends in Research and Development

By A. G. H. Dent, F.R.Econ.S.

WHEN one considers the great changes that have taken place in the character and organisation of British agriculture, it is evident that among the forces of change electricity has still to play a more influential part. Looking back to the Great Britain of one hundred years ago, the grain-growing lands were dominant. But arable Britain was already beginning to change and from 1870 onwards the trend towards animal husbandry was definite. From that date more than half the grain lands have disappeared to be replaced by pasture land for cattle and by land producing root- and mixed-vegetable crops, market gardening produce and soft fruits, or used for poultry, dairy and pig farming. Some of these changes have recently intensified. During the past thirty years the egg production of Great Britain has doubled and its vegetable production trebled.

Economic change and the rise in standard of living, accompanied by diversification of tastes has produced the "mixed farm" which is characteristic of the country to-day. To many townsmen the word farming suggests immediately great fields of wheat or barley standing in the sun, but a more representative picture would be that of dairy produce, poultry, market gardening and livestock, plus a certain amount of grain for consumption by the livestock. However, farming diversity is great and a map of regional farming would be needed to obtain a clear perspective of agriculture to-day.

Of the 448,000 agricultural holdings recorded in Great Britain about two-thirds are below 50 acres in extent, and of these only 10 per cent. are larger than 150 acres. The 448,000 total includes individual farms larger than one acre in area, and if one eliminates very small holdings and very remote farms, a net figure of about 300,000 to 350,000 represents the potential farm market more truly. Of this net total about 10 per cent. are using tractors.

When the electricity supply industry examines the potential demand and consumption of the farming community there is seen to be little relation between area and kWh likely to be consumed, as the variety of produce is too large to enable any definite relationship to be calculated.

Two Classes of Demand

In certain classes of farming it is possible to relate consumption to an index, but generally it is necessary to examine a particular farm in order to assess its probable consumption. This has to be considered in two main sections, farm-house demand and farm-operations demand. The first of these is purely domestic and should bear some reasonably consistent relation to rateable value or size of premises. The second class of demand is variable, as figures from different districts show.

For the year 1930 the returns of the Electricity Commission of all types of farm in the areas of 200 undertakings showed an average consumption of 1,163 kWh, producing an average revenue of £11 2s. at 2.29d. per kWh. Data for 1935 for a sample of 500 farms showed 1,700 kWh per farm per year, averaging about £15. At the same time, figures for 300 poultry farms recorded an average of 6,000 kWh per year and a representative sample of dairy farms also gave the same result. The "factory-farm" recorded an average of 15,000 kWh. Averages taken from different supply zones ranged from 670 to 4,900 kWh per farm, these two extreme figures of the range coming from mainly arable and dairy farms respectively. A good class dairy district yielded £25 per farm per year; a root crop and market gardening district averaged £8.

The latest returns of the Electricity Commissioners, for the year ended March 31st, 1938, give for five rural schemes, covering 1,471 farms, an average revenue of £10 8s. per farm, or 2,500 kWh each at an average revenue per kWh sold of 1.64d. These areas are in detail:—

Scheme	Farms	kWh sold	Average revenue per kWh
Bedford	239	481,982	1.17d.
Dumfriesshire	601	1,005,302	1.77d.
Kirkcudbright Stewartry	147	362,939	2.02d.
Norwich	225	195,663	1.66d.
Shropshire (W.M.J.E.A.)*	259	181,426	1.70d.

* 9 months to Dec. 31, 1937.

The foregoing variations of farm demand show that the supply engineer has to study the "probable revenue" problem with care. If he knows the number of cows in milk on a purely dairy farm or the head of poultry or output of eggs from a poultry farm he has something to work on, but the mixed farm has to be examined in detail. While it might be feasible to determine classifications for farms and to study the demand and consumption figures for them, the data would not be sufficient to use with certainty for various reasons.

The first is that there are not more than 40,000 farms using electricity and many of these emply it for lighting only or for lighting plus a wireless set or domestic iron. The second reason is that the variety of classes of farm would be too many owing to the prevalence of mixed farming. The third reason is that farming—and farmers—change rapidly under the influence of Marketing Boards, agricultural legislation and changing economic conditions.

To illustrate farm variety, a number of classifications from the viewpoint of consumption are given below relating to the main section, poultry farming. These are:—

(a) Hatching (aa) Chicks and table birds
(ab) Chicks and eggs
(b) Eggs (ba) Small hatcheries owned
(bb) Buyers from large producers
(c) Table breeding (ca) Incubators owned
(cb) Buyers from large producers.

Similarly fruit farming has two main divisions: market gardening three, and dairy farming six.

Growth of Consumption

Some supply areas may have little difficulty in obtaining an economic return from farm consumers, other areas may not be so fortunate. It is not difficult to deal satisfactorily with the farm that forms part of a rural community but the isolated farm represents a different problem. The cost of providing this type of farm with supply may be great and there may be little evidence of annual consumption likely to produce an economic return. However, experience shows that consumption during the first year of use is invariably less than consumption during following years, and frequently bears no relation to these subsequent figures.

So much for the farm itself as a section of the rural market. Now let us turn to those factors affecting farm life which influence the demand for electricity. Improvements in communications, rapid and cheap transport and wireless broadcasting have brought the country and the town more close together so that the countryman wants the amenities of the townsman; and electricity is foremost among them. This has led to some criticism among farmers' associations of the rate of progress of rural electrification and of rural tariff levels, criticism often lacking in understanding of the economic problems to be solved.

While some undertakings have not an enlightened commercial record, the majority have attempted to develop rural zones steadily and some have been rapid in this work. The farmer critic of a slow undertaking may be justified in one or two instances, but the majority of rural dwellers have not realised the difficulties imposed on electricity supply development by conditions outside the engineer's control. Among the adverse factors may be mentioned the burden of local rates, the costs and delays of local negotiations and wayleave opposition by landowners, often accompanied by disputes over standard wayleave payments.

Favourable Position

In spite of these obstacles one may say, taking a broad survey, that rural development has reached a position comparable with that in any other similar country and that few areas are without supply. Admittedly, some fringe areas and remote districts are blank spots on the map, and if the peculiar borders of certain supply zones could be replanned with reference to economic factors the situation would be better, but one is dealing with things as they have grown up and as they are.

The development of rural supplies in Great Britain has followed certain definite lines and phases. The spread of supply from urban centres took a natural course towards country townships and large villages and the neighbouring farms served were supplied from the low-voltage networks used. The extension of electricity into less densely populated

rural zones commenced a period of high-voltage distribution on a new scale and during the past eight years development policies have favoured an increasing amount of high-voltage distribution with isolated tappings and spur lines. Capital costs have increased and returns have diminished as supplies have penetrated more deeply into distant zones. At the same time, various classes of overhead costs have increased; in particular, consumer service and maintenance expenses among those undertakings which serve large rural areas. These trends have intensified the problem of capital contributions towards the costs of connection, an economic difficulty which the progressive engineer is as anxious to solve as the progressive farmer who understands the potentialities of the engineer's service. In addition, the "guaranteed revenue" feature of supply requirements from farmers has been an obstacle to development, because in many instances the farmer has not seen his way to use the quantity of electricity required to reach the level demanded by the supply undertaking.

If we ignore such controversial solutions as subsidies, to what extent can research help to solve the problems of the remotely situated farmer who wants a supply? There are two directions: (1) that of cost reduction through simplification and standardisation of supply to remote farms, and (2) that of increasing the consumption per farm to raise the revenue obtainable.

E.R.A. Activities

To help development a plan for research is being carried out by the British Electrical and Allied Industries Research Association. It is examining the standardisation problem of supply to isolated farms and is putting into action schemes of experiment and research in electrical methods applied to various farm processes. These schemes covers both agricultural and horticultural experimental work.

The plans of experimental research are technico-economic in character, aiming at establishing on the technical side the best and most practical technique of doing a farm operation, the most suitable apparatus for this job and the proper method of application. On the economic side the aim is to find the exact cost of the electrical method in comparison with other methods and, from observation of processes, to find out what modifications of practice are desirable to obtain the maximum efficiency from the electrical method.

A scheme of this kind is especially needed to-day when mechanisation of farming processes has been accelerated without an adequate background of reliable data concerning the economics of farm operations and the comparative costs of operations by different processes. Under such conditions, the farmer may well be bewildered by rival claims of manufacturers, for no reliable and authoritative test data are available to guide his choice of equipment and power source. The systematic study of electrical methods and equipment with special reference to operating costs is, therefore, a much needed work, and no more appropriate centre for undertaking such investigations could have been chosen than the Electrical Research Association.

Certain work of this character was carried out by the Oxford University Institute for Research in Agricultural Engineering some years ago, and it became evident that there was need for expansion of activities in this field by the electrical industry itself. In 1937 the Electrical Research Association formed a Committee to consider a plan of experimental research, creating a new Section W for this purpose. After studying the various problems involved, the Committee established three sub-committees to develop different parts of the plan, (A) Supply to Farms, (B) Agricultural Applications and (C) Horticultural Applications.

Improvement in Conditions

Schemes of research have been commenced and others are being examined; at the same time, a thorough study of research work done in various countries has been carried out to determine the progress made. During the course of these activities, contacts have been set up with numerous universities having agricultural faculties and with various agricultural institutions and other interested bodies. This collaboration is proving fruitful and provides a valuable means of making more clear the potentialities of electricity in bettering farm working conditions and in improving various agricultural processes.

The improvement of working conditions on the farm was a subject discussed recently at the fourth Oxford Farming Conference, where matters concerning reorganisation of agriculture were prominent. The trend of the discussions suggested that effective reorganisation depended not only upon the farming industry's capacity to secure and train the labour it required, but also to keep them satisfied under better conditions of work. Such conditions were recognised as not only matters of wages but equally of better facilities, equipment and amenities.

Some recognition of the capacity of electrical service to help the farming industry in these directions is apparent in the interest taken by farmers' associations in getting electricity supply where it is not yet available and in reducing its total costs where it is required as an extension from existing lines.

The electricity supply industry is aware of the farmer's difficulties and the new research work is intended to help in reducing costs of isolated supply through measures of standardisation and of technical change. The second object of research depends for success upon both electrical engineer and farmer since the problem of increased usage is a dual one. If the farmer is to increase his consumption of electricity it must be for economic advantage and, while electrical methods can show in numerous applications a reduction of costs plus advantage in methods, there are sections of agriculture where improvements in design are needed to obtain lower operating costs.

Co-operation between agricultural and electrical interests is spreading through the E.R.A. research scheme. One aspect to be developed is the close study of certain processes in co-operation with the farmer on his farm, under everyday working conditions, to observe running costs, methods of operation and suitability of design of equipment. There are many modern farmers "electrically minded" who are prepared to co-operate in such work.

What Co-operation Could Achieve

Observation of this kind should help to reduce operating costs and may lead to the design of new or improved apparatus for a particular operation. If the farmer, the farm worker who does the job and the electrical engineer combine experience and ideas on a specific process, the result should be valuable. For certain processes there may be an excessive variety of electrical apparatus; for other processes the range may be too limited; change in farming requirements may require the development of a different design with different performance characteristics. Again, there are some operations which call for a high initial power demand with a short running period. If it is practicable to change the hours of such operations the engineer may be able to suggest a type of equipment which has a smaller initial demand with a longer operating period. The load factor of such machinery is then improved and lower rates for power use became practicable. It is in directions like this that co-operation between engineer and farmer can be useful.

One cannot give details of researches undertaken at this time but useful work has been commenced by the three sub-committees of the E.R.A., in close contact with agricultural authorities and the E.R.A.'s agricultural officer in charge of these activities is preparing new schemes for application. In this work, the aim continually in view is the practical one of helping farmer, electricity supply engineer and equipment manufacturer to find the best solution to their common problems.

Meter Testing in France

TWO new decrees on meter testing in France have been issued jointly by the Ministry of Commerce and the Ministry of Public Works. The first provides rules for the tests, while the second forbids the sale of meters by manufacturers except after test. Tests may be made on sample meters chosen at random, unless systematic errors are revealed. The meter must be of an approved type, and the manufacturer has to supply a curve of systematic errors as a function of the load for power factors of 1.0 and 0.5. These errors are not to be more than 1 per cent in excess of the actual consumption.

For both single- and poly-phase meters six determinations are included. At a voltage within 5 per cent. and a frequency within 2 per cent. of the normal the allowable error at maximum load at unity power factor is 1.5 per cent., and at 0.5 power factor it is 2 per cent. At one-tenth load at unity power factor, the allowable error is 2 per cent. Operation at no load is ascertained at voltages between 0.8 and 1.5 times the normal. A starting test is also provided for with a current equal to 0.5 per cent. of the normal at unity power factor. Finally, the gear ratio of the meter mechanism is examined.

All phases of a poly-phase meter are fed with the same single-phase current, the phase windings being connected in series. This is to determine the difference between the error at normal maximum current when all windings are simultaneously in circuit and when any one phase alone is in circuit. The difference in error in the two cases must not be greater than 1.5 per cent.

The tests may be made either at a Government laboratory or at the manufacturers' premises. In the latter case, the manufacturer must supply the inspectors with the necessary test meters, compared before and after use with standards in a Government laboratory, and with helpers, current and equipment.

Motor Survey—VI

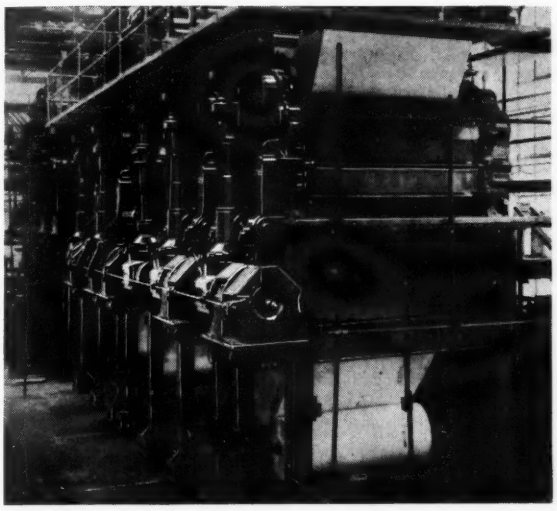
Light-duty Equipment

Some Typical Applications

BECAUSE of its bearing on new and similar industrial applications, the printing office drive is probably one of the most interesting selections from the vast light-duty field. It must be possible to "inch" the press accurately for plating purposes and to run it at a constant dead-slow speed for threading the webs. All the printing cylinders are under constant loading from the impression cylinders, so that the effort required at starting is high, usually about two or three times full load running torque, but this immediately falls after starting and remains more or less constant throughout the normal printing range.

In selecting the examples of light-duty work discussed in the following article consideration was given to references already made to the same or similar applications in previous articles covering such aspects as performance, so as to reduce overlapping as far as possible, and also to later electrical developments

Acceleration from starting to minimum regulating speed must be smooth and so must the regulation of speed when printing to avoid undue stresses in the paper web. The two-motor equipment is advocated by J. H. Holmes & Co. as a suitable way of meeting these varying requirements. It consists of a small auxiliary motor with a reduction gear for inching and leading-in, an over-running clutch coupling, a main motor and the necessary control gear. The auxiliary motor runs at constant speed and drives the main motor shaft through reduction gear, the speed and gear ratio of the equipment being decided by the inching speed required.



In view of the variation in the number of pages from day to day it is uneconomical to use one motor large enough for the complete printing press, and the unit system has been introduced. The photograph, taken during assembly, shows AC variable-speed commutator motors (J. H. Holmes) mounted on press frame and driving through gears.

It was found, Mr. Twizell told us, in view of the variation in the number of pages from day to day, to be uneconomical to use one motor large enough for the complete press if only a part of the press was used for printing. Further, trouble with a single motor puts the whole press out of action. These considerations led to the unit drive, *i.e.*, a separate drive on each printing unit of the press.

Greater flexibility in the grouping of press units with higher efficiency is secured by sectionalising the drive, so that the power available is always just what is required. The torque is evenly distributed throughout the press and the pull is equal on each web leading into the folder. Selector switches for each unit enable the driving motor and push-button control station to be associated with any desired folder, so that all the motors and control stations for a given folder operate as a single equipment.

The unit system is not intended to supersede the two-motor equipment which can actually be used with the unit system. Means for obtaining inching without the two-motor scheme are low voltage on the main motor armature in the case of DC and a variable-speed commutator motor on AC to give a full speed range from inching to maximum.

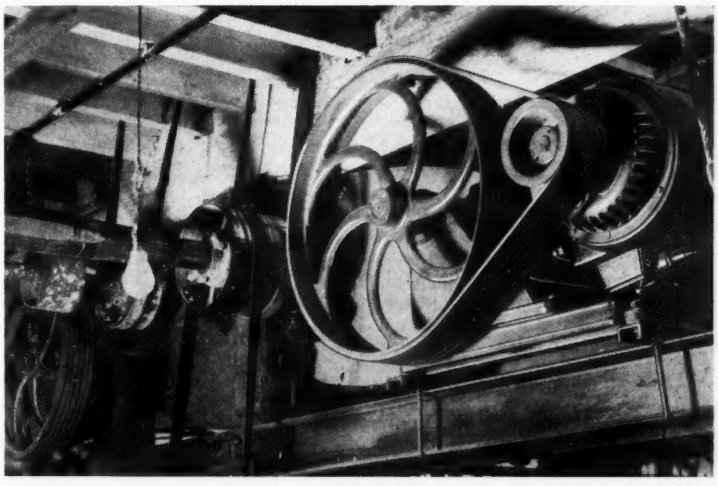
The AC variable-speed motor introduced for this purpose has a characteristic very similar to a DC compound-wound machine, and the AC commutator motor is also advocated for small printing presses, the essential requirements of which are: speed variation, steady speed under varying load and convenient speed control. The controller operated by the brush-gear motor can be fitted with a pre-set speed feature which causes the motor to accelerate from standstill to any predetermined speed when the starting button is pressed. Thereafter the speed is under the control of the "raise" and "lower" push-buttons.

The outstanding drive in the paper mill is that of the actual paper machine in which various sections of the machine through which the paper flows progressively must be driven so that while the paper speed increases as it proceeds through the machine the speed of the machine as a whole must be increased or decreased independently of the relationship between the speeds of the section drives. Such sectional driving represents one of the outstanding developments of variable-speed applications to which a sparate article has been devoted and which brings in the AC *versus* DC controversy.

The secret of sectional driving, however, said Mr. Mason (G.E.C.) lies in some form of differential control, whether the driving motors are AC or DC. While variable-speed work must necessarily have a big influence on the choice of supply, Mr. Mason gave us a very good guiding principle with reference to the paper mill as a whole. He said that if the mill is to cover a wide range of papers then flexibility is a good reason for DC so as to get ease of speed control generally, but if the mill is to produce just one class of paper, such as newsprint, then AC will present no difficulties.

About 50 per cent. of the drives in a paper mill are constant speed mainly in the preparation and finishing departments. The calender speed is usually about 50 per cent. higher than that of the paper machine, so that it can keep level with the production of the latter, with time allowances for loading and unloading. A paper speed of 2,000 ft. per minute is typical.

A main point for consideration in the choice of motors for the textile industry is that the equipment operates in an atmosphere containing a large quantity of fluff so that totally enclosed motors are preferable unless regular cleaning is absolutely assured. Mather & Platt divide textile mill processes into preparatory, spinning and weaving groups. In the first



The trend is to install a self-contained V-belt reduction unit for weaving shed conversion schemes; a Brook driving unit

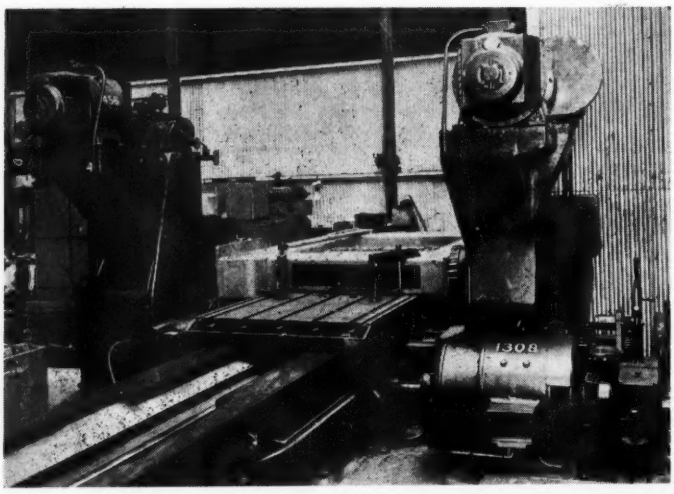
section considerations of first cost often favour group drives for large powers, but individual drives are convenient and afford flexibility of layout and working. Squirrel-cage motors arranged for direct starting are eminently suitable and the high inertia of card cylinders, which require perhaps a minute to bring them to full speed, calls for motors of suitable characteristics.

With regard to ring spinning Mr. Grime said that in order to avoid breakage of the thread during the starting period the motor should be designed to give smooth starting and uniform acceleration. He thought that the small extra cost of a totally enclosed motor (fan cooled if of suitable design) is well worth while. In respect of various methods which have been introduced to afford improvements in quality and output by altering the spindle speed as the diameter of the cop varies the AC commutator motor is now widely used and the speed of this is varied automatically by a mechanism coupled to the ring rail.

As Mr. Frank Brook (Brook Motors) sees it, electrical development in the textile industry is more likely to be associated with conversion schemes than with new factories. This is particularly the case in the weaving shed, at any rate, where the problem is often to apply a modern drive to a low-speed shaft, say, 120 to 160 RPM. Instead of using a low-speed motor the trend is to install a self-contained V-belt reduction unit complete with a high-speed motor, a countershaft and multiple belts, the whole being so arranged that adjustment of the V-belt does not interfere with the second motion drive and *vice versa*.

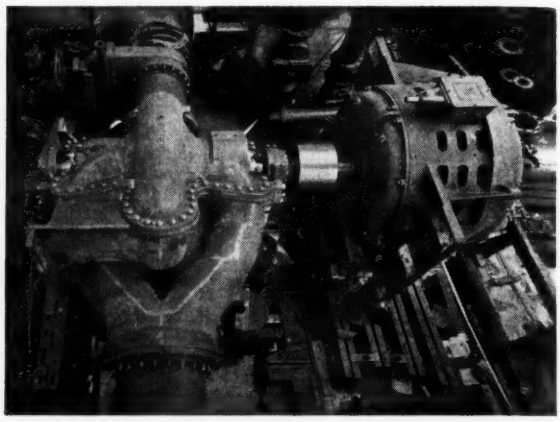
With one very notable exception, said Mr. Bennett (Metropolitan-Vickers) textile motors are not designed for any one particular application. The exception is the loom motor and 50 to 60 per cent. of the electricity supplied to the textile industry is used for cotton spinning and weaving. Depending on the type of loom the motor has such features as high starting torque, high pull-out torque, low temperature rise (because of the demands of the loom cycle), very robust structure, big bearings and heavy shafts. It is nearly always totally enclosed and Metropolitan-Vickers limit the temperature rise to 35 deg. C., *i.e.*, 15 deg. lower than the B.S.S. figure, because the loom takes charge of the motor over a portion of the cycle and produces conditions not comparable with those of the test bed.

We believe that some of the far-reaching motor developments of recent times have been brought about by machine-tool driving requirements, mainly on account of rapid reversals. A reflection of this is the tendency to give motors intended for machine-tool work special ratings, and in referring to their machine-tool rated motor Brook Motors told us that, used chiefly on drills and saws where the load is not constant, this equipment is arranged for intermittent duty. It has a small frame size, and is thus less expensive. For "plugging," *i.e.*, reversing the motor while it is running, special attention must be paid, not only to the mechanical strength of the shaft and bearings, but also to the rigidity of the windings, and Laurence, Scott, for instance, adopt a special method of insulation and impregnation which solidifies the windings and prevents movement of the conductors in the slots or relative to each other.



By using individual drives for the several movements of a machine tool desirable characteristics of each movement can be catered for; Met.-Vick motor drive to each head of a Hulse miller

Mr. Brook said that reversals of 30 to 40 per minute are provided by a s.c. motor with special anchoring of the windings in which a change-over switch replaces the chain of gears, and that for higher reversals than 40 per minute there is a special type of slip-ring motor in which the losses are dissipated in a permanent resistance in the rotor circuit. Lancashire Dynamo have developed a planer drive with a Ward-Leonard system to meet the demands for quick reversals, so speeding up the gaps between operations and returning the table at a high speed. The motor has to have the lowest possible inertia, but apart from that the construction is normal for a ventilated machine.



Waterworks pumps are nearly always of the centrifugal type; a Mather and Platt pump on test bed before being despatched to the Rand Water Board

The B.T.H. Co. considers that machine-tool characteristics are not too well adapted to the commutator motor. Generally there are set speeds with constant HP rather than constant torque. The trend in the development of the pole-changing motor is an effort to bring the motor nearer the job, and often, to give the extreme of this aspect, the stator is built into the machine and the machine-tool into the rotor. Used with gearing still greater ratios can be obtained by the pole-change motor.

Metropolitan-Vickers say that with variable-speed DC motors driving the spindles of large lathes speed variation can be arranged by shunt control and that ranges of three or four to one are usual. The auxiliary drives such as quick traverse drilling attachment, chip conveyor and suds pump may be by small direct starting s.c. motors. By using individual drives for the several movements in this way desirable characteristics are readily obtained for each movement, which would not be the case with belt drives.

The chief problem presented with presses is starting up from rest. The actual operation of the ram is effected by means of a clutch worked by the operator's foot which brings down a guard at the same time as the ram. A Metrovick s.c. motor for small presses has a high percentage slip at full load, so that the load is taken up by the fly-wheel itself.

Apart from quiet running which we have already dealt with, the chief problem associated with lift driving is levelling. On low-speed lifts, according to Mr. Steward (Bull Motors), this is not a very serious problem, but as soon as the lift speed reaches values of, say, 200 ft. per min. and more, then it is necessary to reduce the lift speed immediately before stopping at a floor. This requires a two-speed or multi-speed motor. For DC the motor is designed for a speed of, say, 500 RPM. at full field and arranged for speed adjustment up to, say, 1,100/1,250 RPM. by shunt regulation. The s.c. motor has a single s.c. rotor, but two distinct windings on the stator, one winding being designed for, say, 1,000 RPM. and the other for, say, 250 RPM.

The demand for greater ratios by way of higher lift speed with suitable levelling has led to the tandem motor which, Mawdsleys explained, consists of a high-speed slip-ring motor mounted on the same shaft as a high-torque low-speed s.c. motor. The speed ratio is as high as six to one with a top speed of 1,000 RPM. The lift is started by exciting the high-speed stator and cutting out the rotor resistance. Near the end of the run the high-speed stator is cut off from the mains and the low-speed winding is connected. This decelerates the lift and gives a very low speed for floor levelling.

The B.T.H. Co. gave us an informative view of the relationship between lift speed and the motors suitable for them; up

to 120 ft. per minute, the induction motor; 200 ft. per minute, the tandem motor; 350 to 400 ft. per minute, the AC commutator motor; above 400 ft. per minute and for particularly fine decking, the DC motor with a gearless drive and Ward-Leonard control.

The characteristics required for crane and lift motors are basically the same, although in the case of cranes the DC motor has probably a greater hold because of its earlier entry into the field. The B.T.H. Co., however, refer to two types of crane for which the Schrage motor is very suitable. The foundry motor has to handle loads quickly in suspension, but slowly on the ground (removing the casting from the mould), while on the wharf the crane has to draw its load out of the ship's hold slowly, but quickly once it is clear of the ship. Hoist motors follow similar lines with special requirements by way of high starting torque and very high overload capacity. They are nearly always short-time rated, said Mr. Richards (Higgs Motors), and they are usually totally enclosed. The self-contained electric hoists of Fuller Electrical employ geared motors, the main motor being a low-speed unit —usually s.c. or s.r. It has a tapered rotor which is sucked in when current is applied, thereby releasing the brake.

Pumping Installations

In reviewing present-day practice in pumping applications Mather and Platt said that waterworks pumps are almost entirely of the centrifugal type and that the duties may be roughly classified as borehole pumps, booster pumps and general supply pumps. Many of these applications call for variations in head and quantity delivered, so that some degree of speed variation is frequently necessary. For a small speed range a plain slip-ring motor with rheostatic rotor control is the least expensive and simplest drive, which may also often be the most efficient, particularly where a variable quantity at fixed head is required.

For a wider speed range it becomes necessary to consider the relative advantages of such schemes as Scherbius control. AC commutator motors or conversion to DC, and the DC scheme is often by no means the least favourable. In the case of booster pumps required only for occasional use in periods of heavy demand automatic starting and stopping is sometimes called for, in which case a plain s.c. motor direct-on starter is the simplest and the cheapest and most reliable type possible.

Modern ideas, the B.T.H. Co. stated, place less reliance on surface supplies and bore-holes now have depths down to 2,000 ft. Newer schemes yield a million gallons per day and variable heads often have to be catered for. The centrifugal pump serves well for such schemes and it generally requires a motor with a comparatively small speed range. Where this range is less than 10 per cent. it is not practicable to employ special variable-speed equipment.

The laundry is a field which requires a number of special types of motors, and Bull Motors pointed to such a unit for hydro-extractors. The basket has to be accelerated steadily but fairly rapidly up to its full speed, run at that speed for a predetermined time and then brought down steadily and rapidly to a standstill, frequently by the use of dynamic braking or "plugging." In a later development the motor is built into the hydro-extractor itself and the basket is suspended on its shaft.

Frequent reversing is required for washing machines and to prevent overheating the rotor is specially designed. Special impregnation is desirable for laundry motors on account of the humid conditions, and Mr. Cass (Crompton Parkinson) told us that in the case of brewery motors they had found it profitable to treat the windings similarly as a guard against the action of fumes.

With acid and water everywhere conditions are particularly bad in the plating shop, but protection is practically nil. The driven generator must of necessity be of the open type to permit the required heat dissipation consequent upon the very heavy currents (low voltage) produced, and so it would seem incongruous to put a totally enclosed motor on the bed with the comparatively expensive open generator. The cost of making the generator totally enclosed is prohibitive.

In the Laboratory

We should like to see greater consideration given to laboratory applications in connection with which Dr. Macfarlane said that there are three schools of thought. The first demands open machines to demonstrate principles, the second requires modern standard machines to demonstrate existing practice, and the third calls for entirely specialised machines to demonstrate theories, research and practice. He suggests as the ideal a combination of the three, with particular attention to the last, and says that the essential equipment in a school laboratory should include a rotary convertor set, a dynamometer unit and motor and dynamo.

With reference to applications in the testing of internal combustion engines Mawdsleys stressed the necessity to see that exhaust fumes cannot collect in the motor. On the surface this suggests a case for the totally enclosed motor, but because of the very high speed (6,000 RPM or more) total enclosure is not practicable because enormous stresses are likely to be set up owing to the larger rotating parts.

Patents in Wartime

AMONG the measures before Parliament this week was the Patents, Designs, Copyright and Trade Marks (Emergency Bill. The first clause of this makes "provisions as to existing licences under patents, designs and copyright of enemies or enemy subjects and as to contracts relating thereto." It provides that notwithstanding Section 1 of the Trading with the Enemy Act, 1939, or any rule or law relating to intercourse with enemies, a licence in favour of a person resident in the United Kingdom or the Isle of Man or any contract relating to such a licence shall not be invalidated by the fact that the proprietor or owner or any person otherwise interested is an enemy. The section does not render valid any grant or assignment made during the existence of a state of war or authorise the performance of any contract in a manner inconsistent with the provisions of the Trading with the Enemy Act or other rules of law relating to such matters.

The Comptroller of Patents is empowered to revoke licences or to revoke or vary the licence conditions or contracts where an enemy is, or has at any time since the beginning of the third day of September, 1939, been the proprietor of a patent or registered design or owner of copyright or entitled to any other interest therein (except as a licensee) upon the application of the licensee or other interested person.

Clause 2 empowers the Comptroller to grant licences under patents, designs or copyright of enemies and enemy subjects. Orders made under this section can be varied or revoked.

Clause 3 gives the Comptroller power to suspend trade mark rights of an enemy or enemy subject.

Clause 4 permits the granting of patents and the registration of designs and trade marks on the application of an enemy, but it is provided that the grantee or person registered shall not be entitled to require the delivery of a patent or the grant or issue of a certificate of registration and the patent, or rights conferred by registration, are to be subject to "any relevant provisions of any enactment for the time being in force relating to the property of an enemy." The Comptroller has discretion to refuse such applications if he considers that it is in the public interest to do so.

Clause 5 provides that, subject to conformity with the Trading with the Enemy Act, any copyright agreements with enemy countries shall subsist unless any Order in Council made under the Copyright Act, 1911, is revoked and the copyright of an enemy which subsists under such an Order in Council shall continue.

Clause 6 provides for the extension of time limits of patents, etc., by the Comptroller having regard to war circumstances.

The other sections of the measure are mainly of an administrative character. Copies (Bill 270) can be obtained from the Stationery Office, York House, Kingsway, W.C.2, price 3d.

Control of Metals

THE Minister of Supply has issued the Control of Aluminium (No. 2) Order, 1939, dated September 9th, 1939. This Order makes the sale and purchase of aluminium and aluminium alloys situate in the United Kingdom subject to a licence granted by the Minister. On and after September 23rd the use of any such material for the purpose of any manufacture or work will similarly require a licence. Applications for such licences or for any information in regard thereto should be addressed to the Ministry of Supply, Aluminium Control, Raven Hotel, Castle Street, Shrewsbury.

The Minister has also issued the Control of Non-Ferrous Metals (No. 2) Order, 1939, dated September 7th, 1939, under which the Schedule of maximum prices attached to the Control of Non-Ferrous Metals Order, 1939, dated September 1st, 1939, is cancelled and a revised Schedule is substituted therefor. Apart from minor adjustments in the maximum prices specified in the previous Order, the main effect of the revised Order is to clarify the position as regards the premiums or other charges which may be made in accordance with the usual trade practice for deliveries elsewhere than at the points specified. Copies of the Orders may be purchased directly from H.M. Stationery Office.

I.E.E. Regulations—V

ACCESSORIES AND APPLIANCES

By H. R. Taunton, A.M.I.E.E.

THE first rule in Section 6 is a new one here, but actually it is the old Rule 4a, already replaced in this edition by Rule 2. Its repetition in Rule 601, however, makes a suitable introduction to the section.

In clause A of Rule 603 the former reference to Section 13 is omitted. This is the case in many other rules in this section and elsewhere, and need not be further remarked. Clause C is shortened by the omission of the first half, covered by the reference to Rule 1001B. To D has been added a practical exemption. F is new, and deals with supports for flex on fittings, etc.

Rule 604 is that which, it was suggested in the preceding article, would be more appropriately included in Section 5, as it deals solely with temporary wiring in flex. Note the words "are permitted only," which converts the old Rule 603 into an amplification of the new Rule 413, prohibiting the use of flex for fixed wiring. Clause D is an amendment of the old 405C, with the now familiar addition of the prohibition of contact with any other wiring system. Clause E replaces the old 405D and, rather strangely, does not include the former limit of 3-ft. intervals between supports. It is a word-for-word repetition of all but the first line of 603D; and as this is on the opposite page, a simple reference should have been enough.

References, admittedly, are irritating, carried to excess. Speaking from memory, there were cases in the last edition of references to rules which contained further references. They wasted time more valuable than any space they saved. That may often be reason good enough for the repetition of a short rule which might be looked for in more than one section. On the other hand, a reference is simpler and better when it avoids the re-stating of a long, many-claused rule, or of the same rule in the same section; and certainly when, as in the present case of 604E, the required reference is actually within eyeshot.

Two-pin Sockets

In Rule 605, note Clause C, which is new and drastic. Since no small domestic appliance or lighting standard is fitted with double-pole switches, and to fit them would in many cases be impracticable (*e.g.*, an electric shaver) this clause, in effect, bans entirely the use of ordinary two-pin sockets. At the present moment it must be the most universally broken rule in the book. What steps contractors and users will take to comply with it is a question—not a very interesting one, because the answer is so obvious.

Nothing is said, by the way, in Rule 701 (control of appliances) to support 605C. Moreover, it is largely negatived by Rule 607, which still allows, though it deprecates, the use of lampholder plugs. It also limits their use to appliances of 1 A or less, instead of the former 2 A. Unfortunately, it doesn't—it cannot—tell us how to prevent an optimist plugging a 2-kW fire into a lampholder, as soon as the contractor hands over the job.

In Rule 608, the old, lengthy 607, dealing with sockets and plugs, the first clause A is needless—see 601. Clauses H, I and J replace the old clauses G, H, J and K. Largely by dealing separately, in Clause I, with the "E" terminal, they shorten and make clearer what was a confusing mass of detail, which for its elucidation needed a diagram volunteered by the A.S.E.E. Even now a diagram would be helpful.

Clauses B and C of Rule 610 replace, in a much expanded form, Clause B of Rule 609 of the 10th edition, with its later amendment. All that remains of the old Rules 610, 611 and 612, relating to circuit-breakers, is the preamble of 612 and its short clause C; and nothing has been lost thereby. Most of it was needless, repetitive wordiness.

Rule 612 (fuses) is the former 614 and 615 (cut-outs), rearranged and much amended. As a guide to comparison of the two: A (i) is equivalent to old 614B; A (ii) and the preamble, to old E; A (iii), to old C; B is new; C is the old 615 without its clause B, and with a new note; and D is new. B, one of the new clauses, is a sound one, and the wonder is that it has not previously appeared in the Wiring Rules. It prohibits fitting a fuse with a fuse link larger than that for which the fuse is designed. A common sin, that.

Clause A of Rule 613 has been shortened, with advantage. Clause B is as before. The old difficulty remains: a contractor leaves a hall or large office equipped with sockets on different phases, and the user attaches his portable appliances later, as he needs them—and he never thinks of wiring them with armoured flex. The true remedy is to avoid bringing different phases into such places, and that can generally be arranged with a supply company not too pernickety about balancing the load of each separate installation. In Rule 614B note the addition of "kitchens and sculleries."

The first two rules of Section 7 of the 10th edition have been deleted, so that its Rule 703 becomes 701 in the present edition. In the note to Clause A, it is mildly interesting to see that the word "effective" has been corrected to "effectual." Someone must have been reading Fowler's little essay on these two words in "Modern English Usage."

Fixed Heating Appliances

Clause B has an important amendment. It now insists that control of fixed heating appliances should be within "easy reach" of them. The old rule was satisfied if switches were in the same room, and also allowed thermostatically controlled appliances to be switched from a distant point, *e.g.*, a disboard. Now they must, if not "fed from an adjacent socket-outlet" have, in addition, local control. The limit of 5 kW for final sub-circuits feeding such appliances is now abolished. Clause D (old E) has been amended in the same sense. In fact, the greater part of it is a repetition of B.

Rule 702 has been improved by re-drafting. For instance, part of Clause C now reads that a motor, etc., must not be placed near woodwork, and so on. In the old edition, by a curious inversion of natural sequence, we were told that woodwork must not be placed near a motor. Note the new limits—less or more than ⅓ HP—in Clauses D and E. Rule 703 is amended, and has a new note to Clause A. The horse-power limit in this rule is ½. For a difference of ⅙ HP it would surely have been simpler to have made the limits in 702 and 703 the same. They would have been more easily remembered if both were ¼ or ½ HP.

Clause B of Rule 704 is new. Rule 705 has a note added, making what was formerly a rule (707B), on the point of outside ventilation, now only a recommendation. Clause B of 706 is new. Rule 708 is the old 710 as amended in 1935, and now exempts transformers in motor starting and control gear. A note to Clause B tells us that a toy electric railway is now a "portable appliance" within the meaning of the Act. Rule 709, a longish one dealing with bells, etc., is almost word for word the same as Rule 412.

Electrode Water Heaters

Rule 711 (electrode water heaters) has been expanded to double the length of the old rule, 714, and rearranged. One clause, B, however, of less than six lines, replaces the former 715, which, with three clauses and a note, ran to nineteen lines. It is an example of what can be done in the way of condensation. In its shortened form it is clearer and it misses not a single point of the old, clumsily-worded rule.

There is excuse for the expansion of the rest of the rule, for it contains new matter, the result of recent experience of water heaters. Clause A, prohibiting their connection to DC supply, is new. Clause C is much amended, and the former alternative limit of 100 A for the out-of-balance current is deleted. Clause E has grown from six lines of the former F to nearly half a page. Note that push-button control, with indicator lamp, is now required where a circuit-breaker is remote from the water-heater it controls. Clause F now calls for indicator lamps where the circuit-breaker is not readily visible from the water-heater; and not, as before, only when it is at a distance therefrom.

Rule 712 is the former 713 with the 1935 amendment and the addition of a phrase exempting bell transformers under certain conditions. Rule 713 is as before, with the addition to Clause C of a proviso against poisonous fumes.

There was only one rule about electric signs in the 9th edition; but Section 8 in the present edition runs to nine pages, three more than in the 10th. This is the sad outcome of the "publicity" thought necessary to modern progress but now temporarily thrown out of action.

Rule 801 is the defining rule, now logically put first, instead of second, as it was. The old 801 (filament-lamp signs) is now 813 and, except for Clause A, is entirely rewritten. The rest of the section is concerned with "luminous discharge tube" signs.

Rule 802 covers the former 803 and 804, and there is nothing startlingly new in it. Rule 803 similarly covers the former 805 and 806, and is somewhat shorter. In Rule 804 (formerly 807) a note has been added to Clause A, and in Clause B the

"conspicuous notice" is now defined in wording and dimensions. Rule 805 is the former 804B, with the addition of a note, and the word "adjacent" to particularise the "means" of control.

Rule 806 (fireman's switch) has been considerably amplified. Under Clause B, if the switch is not "as nearly as possible vertically below the sign" a suitable notice must be fixed indicating its position. E is a useful new clause; and F, with a good note, replaces the former C. Rule 807 is more definite than the old rule on "warning notices" and gives details of wording, colouring, and sizes.

Cables and Conductors

Rules 808 to 810 (cables, &c.), replace the former rules 810 to 813. They are considerably amended, and there is an extra page of new matter. Bare conductors must now have a sectional area of not less than 0.0006 sq. in. Much of the new matter is in Rule 809, giving details of the supports required for high-voltage cables; and the old Clause G (of 810) has been divided and made clearer by two clauses, D and F, with short tables similar to that formerly given in the old Clause F, which remains unchanged. A useful note on corrosive agents has been added to 810E.

Clause B of Rule 811 gives details of warning notices for transformer enclosures exactly the same as those in Rule 807, and a reference to that rule would have been sufficient. Rule 812 deals separately with transportable signs, which were formerly included, under Rule 803, with fixed signs. Much of the contents of this rule is naturally a repetition of the present Rule 802.

Passing now to Section 9, we find Rules 901 and 903 tallying with those in the 10th edition. They have some slight amendments and are rather more wordy, but are much to the same effect. All the other rules of the 10th edition disappear entirely. That meets very satisfactorily the criticism made of them, that they were no concern of contractors or others interested in the "installation" of radio, but simply of the manufacturers of the apparatus, who may or may not have heeded them—probably not.

There is no reason why the whole section should not disappear in the next edition. Rule 901 simply says that the section—in effect, Rules 902 and 903—applies to certain specified apparatus; and 903A, referring to cable connections, says no more. Rule 902 is practically covered by several other rules in the book. What is left, 903B, might easily be provided for in, say, Section 8.

Electrifying Russia's Railways

Rate to be Accelerated

THE first railway electrified in Russia was, according to an article by M. Serdinov in *Electritchestov*, a 20-km. track of the Moscow-Jaroslav Railway on a Moscow suburban section with a heavy passenger traffic. This was in 1929 and the electrical equipment was supplied mostly from the United States and Italy, the construction being supervised by foreign engineers. In 1938 over 1,690 km. of electric railways was in operation, practically all the equipment was being supplied from Russian factories and the construction was carried out by Russian engineers.

The voltage adopted for the DC overhead system was originally 1,650, but was later increased to 3,300 for main lines. The motors, which have a capacity of 340 kW on all but experimental engines, are designed for running on both systems. Recent developments are shown in Table I.

TABLE I

	1933	1938
Length of electric railways, km.	351	1,690
Freight electrically hauled, million tons per km. :—		
Net	100	6,573
Gross	205	10,900
Total distance run by locomotives in passenger service, 1,000 train-km.	156	2,225
Total distance run by motor-coaches in suburban traffic, 1,000 train-km.	3,032	14,335
Average speed of freight trains in km. per hour	20	41.5
Average speed of suburban trains in km. per hour... ...	48.0	52.0
Energy supplied, million kWh	37.2	429.3
Energy in Wh per ton per km.	37.0	24.2
Average daily run per locomotive, km.	154	400
Average daily run of motor-coaches, km.	430	565

It is computed that the conservation of high-grade coal during the past ten years, has amounted to 1.51 million tons. Allowing for the lower grade of fuel used in generating stations, however, the saving exceeds 2.1 million tons.

Cheaper than Steam

The average total cost of transport on electrified railways for the year 1937 was 0.512 copeck per ton-km., compared with 0.78 copeck under the same conditions with steam locomotives.

In 1937 on seven electrified railways one electric was equivalent to 1.7 steam locomotives. On some railways, *e.g.*, the Trans-Caucasian, one electric replaced 3 steam locomotives on sections with steep gradients and 2.5 on moderately steep gradients. The traffic on the electrified sections was 9.62 million tons per km. of track as against 6.53 million tons for the rest of Europe.

Motor-generators and mercury-arc rectifiers were supplied from abroad for suburban sub-stations up to 1931 and for main lines up to 1934. Afterwards the whole of the plant was made in Russia and gave complete satisfaction with the exception of mercury-arc rectifiers made in 1936, which gave trouble due mostly to an unsatisfactory anode construction.

In 1930, the total capacity of the sub-stations was 5,000 kW. The capacity after that rose from 22,000 kW (17,000 kW imported) in 1933 to 233,000 kW in 1938, and at present is about 260,000 kW, in the last two cases only 29,000 kW of plant was of foreign origin. Corresponding figures for main line sub-stations are: 8,000 kW (all imported), 170,000 kW and 186,000 kW, the last two figures including 20,000 kW from abroad.

The reliability of the service has improved and the number of breakdowns per 100 km. of track in 1938 was only 41.4 per cent. of those in 1935.

During the ten years of electrification several types of locomotives have been used. The earliest were similar in construction to those employed in the United States and Italy, but later the home factories developed their own designs. The main particulars of the latest 0-3-3-0 five-point suspension type V.L.22 adopted in 1938 and standardised for 1939 and 1940 are: Weight, 132 tons; rating, 2,040 kW; tractive effort, hourly rating 24 to 20 tons, continuous rating 20 to 17.5 tons; weight per axle, 22 tons; gear ratio, 1/4.45 to 1/3.74. Regenerative braking is employed. Auxiliary machinery is fed at 3,300 V. Experiments are being made with a locomotive equipped with six 450-kW motors, but data are not yet available.

Plan to Convert a Further 1,840 km.

The rate of electrification of railways is to be considerably increased during the next five years, and it is expected that by the end of 1943 an additional 1,840 km. will be in operation, 971 km. of which is under construction. The extensions include 413 km. of suburban track and 507 km. of main lines for heavy freight traffic, the remainder being single-track lines with heavy traffic. It is expected that the saving on coal in 1943 due to electrification will exceed 1.8 million tons.

At present all energy for the railways is supplied from district power stations and is transformed in sub-stations to 1,650-3,300 V DC. The possibility of erecting special railway power stations is, however, under consideration and when this is done the supply may be changed from DC to AC at 16⅔ or 25 cycles. It is also proposed to introduce distant control of sub-stations and automatic control of track sections.

X-Rays in Metallurgy

FOR the autumn meeting of the Iron and Steel Institute which was to have been held at Cardiff from September 12th to 15th but which had to be cancelled, Dr. A. J. Bradley and Mr. H. J. Goldschmidt had prepared a N.P.L. paper on "An X-ray Investigation of the Iron-rich Nickel-iron Alloys." In this paper are discussed the unexpected results, inexplicable on the basis of current views, which are shown by X-ray powder photographs after long periods of heat treatment.

Although there are only two types of structure (body-centred cubic and face-centred cubic) the system is complicated. Reactions take place at two definite temperatures, 580 and 350 deg. C. Below 580 deg. C. there is a sudden broadening of the two-phase gap, which is quite narrow above this temperature. From 580 deg. down to 350 deg. C. $\alpha+\gamma$ two-phase structures are formed at all compositions between about 6 and 8 per cent. nickel (α) and 23 and 26 atomic per cent. nickel (γ). At about 350 deg. C. the α and γ phases react to form α_1 with the approximate composition Fe_3Ni, which is a low temperature body-centred cubic phase. Direct evidence for the two-phase region $\alpha+\alpha_1$, is unobtainable because the lattice spacings are almost identical. The $\alpha_1+\gamma$ region stretches from about 25 to 40 atomic percentage nickel at 325 deg. C. Invar, the composition of which places it in this region, must be regarded as a supersaturated γ solid solution which may under certain conditions of heat treatment precipitate Fe_3Ni.

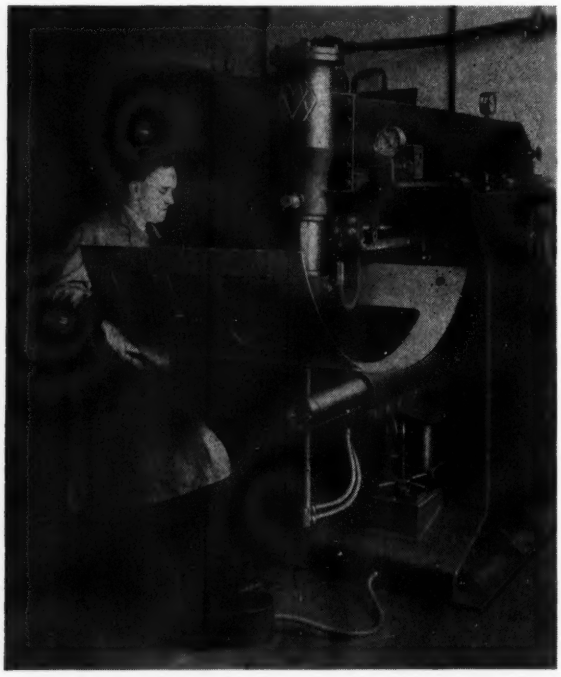
WELDING ALUMINIUM

Ignitron Programme Control

A NEW type of spot welder, details of which have been sent us by the Metropolitan-Vickers Electrical Co., Ltd., is specially designed for spot welding aluminium and its alloys, with particular reference to Duralumin and other heat-treatable alloys. These machines, which are manufactured in two sizes, are of particular interest because of the programme control Ignitron equipment used in conjunction with them, by means of which a series of operations, accurately timed, is carried out in a predetermined sequence.

The smaller of the two machines with the Ignitron panel mounted alongside is illustrated in use. The welding transformer is water-cooled and has a continuous rating of 100 kVA, with an output up to 390 kVA on spot welding service. The other picture shows the larger machine, which has a throat depth adjustable up to 6 ft., the welding transformer having continuous and intermittent ratings of 165 and 650 kVA respectively. The 390-kVA machine has a throat depth also adjustable to a maximum of 3 ft., and on both machines the throat gap, or distance between top and bottom conductors, is widely variable. The distance between the top conductor and the plane of the electrode tips is made somewhat larger than on many machines of this type in order to allow formed panels to be welded with the curvature upwards. Stiffeners are invariably welded on the concave surface of such panels and, for obvious reasons, it is an advantage to have the stiffener on the top side of the sheet when welding.

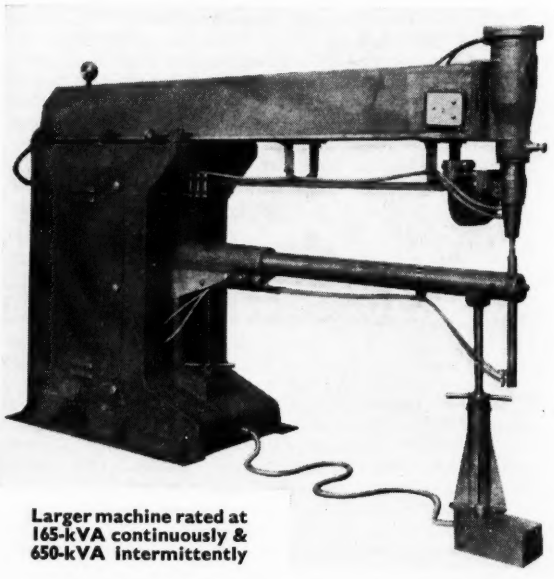
The special Ignitron control panel incorporates a form of programme control by means of which the welding current can be reduced in value at any instant during its flow. It is intended that the control shall be used to effect a high initial current followed immediately by a reduced current: the former is the actual welding current, while the latter gives a post-heating or heat-treatment effect to the weld just formed. The values of the initial and final currents can be varied independently of each other, and, with the addition of 20 tappings on the welding transformer, it is possible to obtain infinite variation of current values.



Small machine (100-390-kVA) in operation. Ignitron panel on left

In addition to the above feature it is possible to apply an increase of pressure or upset pressure, at any desired stage of the weld cycle. This is arranged by employing a differential type air cylinder and a special air valve which exhausts the lower side of the piston at the required instant.

The time of current flow, both of the initial and final currents, is adjustable by means of calibrated dial controls mounted on the hinged cover of the panel and a separate calibrated dial allows the actual time of pressure increase to be pre-selected. The control of the equipment as a whole is by means of a foot switch in conjunction with a small panel mounted adjacent to the welding head, and it is possible to employ "continuous spot" operation with speeds up to 20 welds per minute.



Larger machine rated at 165-kVA continuously & 650-kVA intermittently

The object of the special control equipment giving the "heat-treatment" period at the end of the weld period, during which reduced current is supplied, is to control the cooling rate of the fused zone. The weld zone in aluminum alloys is always molten for a certain period due to the very narrow plastic stage associated with these materials, and it is during the cooling period that cracks and unsoundness must tend to appear within the weld bubble.

It can therefore be argued that control over the rate of cooling, together with additional pressure applied at this stage to consolidate the weld, should be of benefit when welding "strong" alloys, and this is borne out by experimental results which indicate that an increase of 30 per cent. more in the shear strength of spot welds can be expected.

Electricity in Metallurgy

AMONG the papers which were to have been presented at the autumn meeting of the Institute of Metals, arranged to be held in Glasgow from September 5th to 8th, which had to be cancelled, was one on "The Anodic Oxidation of Aluminium" by Dr. J. W. Cuthbertson, and another on "The Protection of Silver by the Electrolytic Deposition of Beryllia" by Dr. L. E. Price and Dr. G. J. Thomas.

The first gives the results of investigations with the aid of a cathode-ray oscillograph of the anodic oxidation of aluminium in a number of different electrolytes using AC electrolysis. The effect of the oxide barrier on the form of the current-time and current-voltage curves is shown to depend on the constitution of the electrolyte and operating conditions. Owing to a capacity effect, the current and voltage are always out of phase during the whole or a part of each half-cycle. The current-voltage curve consequently is a closed loop, the area of which is proportional to the dielectric loss in the film. The results obtained suggest that, while the mechanism of anodic oxidation in chromic, sulphuric, and oxalic acid baths is similar, chromic acid solutions should produce the more satisfactory films.

In the second paper the conditions necessary for the production of highly tarnish-resistant films on silver from a solution of beryllium sulphate are dealt with. The p_H of the solution must be between the p_H corresponding to the formation of the basic sulphate $BeSO_4$, $Be(OH)_2$ and the p_H for the complete precipitation of the hydroxide.

Observations of the cathode potential during the deposition have shown that it is possible to follow the formation of the film of beryllia. Protective films on silver have also been obtained by cathodic treatment in solutions of beryllium nitrate, beryllium chloride, and aluminium chloride and sulphate.

AMERICAN DEVELOPMENTS

By G. E. Wittig (New York)

ELECTRICITY for industrial, commercial and residential use in the U.S.A. is supplied mainly by public utility plants and secondarily, but in no small measure, by plants operated in connection with large industrial establishments. Public utility plants are operated under two types of ownership; by far the larger portion are privately owned, *i.e.*, stock companies, the remainder being municipally owned. Latterly, hydro-electric construction by the Federal Government has been undertaken on a large scale in several parts of the country where resources exist for developments of unusual magnitude.

Survey of Supply and Manufacture

Electric public utility plants in the United States have an aggregate rating of 38,335,000 kW and had an output during 1938 of 115,825 million kWh, according to preliminary estimates. Of these quantities the electric light and power industry, which represents an investment of $14,000 million, comprised about 36,000,000 kW and accounted for an output of 109,000 million kWh. The difference between the two groups of quantities represents the capacity and output of electric railway, Federal and other plants which do not contribute to the energy sold for light and power.

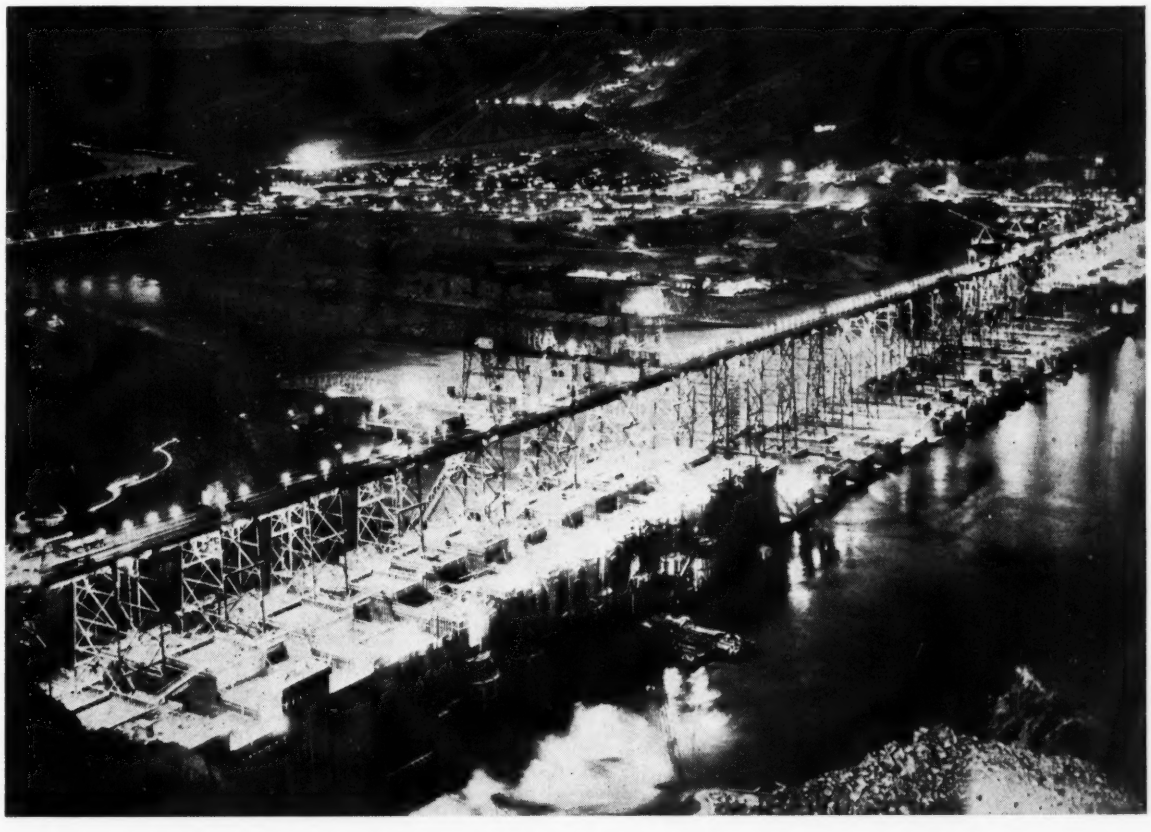
Of the 36,000,000 kW, 25,600,000 kW is steam-driven, 9,700,000 kW is in hydro-electric plants, 700,000 kW is driven by internal combustion engines. Of the annual energy output 67,600 million kWh was produced from fuels and 41,400 million kWh from water power. Thus, while hydro-electric plants constituted only 27 per cent. of the total capacity they contributed 38 per cent. of all the energy generated. In explanation it must be pointed out that water-power plants are in general, and with but few important exceptions, operated in conjunction with steam on the same or interconnected systems and when so operated are used, as far as practicable, as base-load stations. These statistics are for the year 1938. They are in part estimates and are necessarily approximate, but they are sufficiently accurate for present purposes.

The quantities may be expressed in kWh per capita on the basis of a population of 130 million. Electric service was being supplied at the end of 1938 to 27,765,000 consumers, of whom 23,420,000 were classed as residential (including farm customers), the others being commercial and miscellaneous. The estimated revenue received from these consumers amounted to $2,172,750,000. Energy production and revenue were larger than in any other year except 1937.

Despite the unsatisfactory economic conditions in recent years the industry has continued to make remarkable strides, as is evident from a comparison with 1929, the year before the depression. In the intervening period the number of customers has increased by 13 per cent., sales of energy by 24.3 per cent., and revenue by 21 per cent. More than half of the energy sold is used for industrial purposes; about a fifth is for the home. More specifically the percentages in 1937 were: Large commercial power and light —essentially industrial—53.8, residential 19.4, small commercial 17.7, others 9.1. Steady technical developments have resulted in continuously greater efficiency in the utilisation of fuels; in 1919 the average consumption was equivalent to 3.2 lb. of coal per kWh, in 1938 it was 1.42 lb. A measure of the new plant construction for growth and replacements is afforded by the result of a survey recently conducted by the *Electrical World* of New York. This lists an aggregate of about 1,700,000 kW installed during 1938 in 99 plants, and 1,400,000 kW scheduled for 1939 in 69 plants. Much the larger portion of this is in extensions to existing plants, especially in the case of steam. There is a pronounced tendency to make these additions in the form of "superposed" units.

In recent years the Federal Government has entered on a programme of water power development on a large scale, generally in connection with flood control, navigation and irrigation as primary objectives—actually or ostensibly. The prospective ultimate capacity of these developments will be 6,400,000 kW, of which 1,175,000 kW was in operation at the end of 1938, while additions during that year were 455,400 kW.

Chief among these in point of present development are the Tennessee Valley Authority group of four dams with a total of 421,600 kW, to be increased to eight with a total of 1,500,000 kW in the south-eastern part of the country, and Boulder Dam in the south-west with 535,000 kW, which is to be expanded to 1,320,000 kW. This dam closes a canyon of the



Night view of the Grand Coulee Dam designed for an ultimate development of 1,975,000 kW

Colorado River and provides a head of 522 ft. For the transmission at 287,500 V—believed to be the highest commercially used voltage—over a distance of some 250 miles, hollow conductors made of interlocked segments are used. The most imposing development now in progress is in the north-western part of the country at Grand Coulee on the Columbia River. Scheduled for completion in 1964, it is ultimately to provide 1,975,000 kW of power and to furnish water for the irrigation of 1,200,000 acres.

Recent Electrical Works

High speeds, high pressures and temperatures (in superposed units) and the increased use of hydrogen cooling are features of large steam-driven generators installed during 1938. Maximum steam conditions thus far are 1,250 lb. per sq. in. pressure and 950 deg. F. One large manufacturer states that three large superposed units installed during the year have high-pressure, high-temperature turbines of double-shell construction and their 3,600-RPM generators are hydrogen cooled. (It will be recalled that the standard frequency in the United States is 60 cycles.)

The 60,000-kW unit of the Ohio Power Company at Windsor operates on 1,250-lb. 925 deg. F. steam, exhausting to station mains at 235 lb. gauge pressure. The 53,000-kW unit of the Consolidated Edison Company of New York operates on 1,200 lb. 900 deg. F. steam and exhausts at 200 lb. The 50,000-kW unit of the Public Service Electric and Gas Company, in New Jersey, operates on 1,250 lb., 950 deg. F. steam and exhausts at 235 lb. Including these new machines, nine turbo-generators, ranging in size from 25,000 to 150,000 kW, and having a combined capacity of half a million kilowatts are stated to have been operated in hydrogen at the end of the year. Seven of them run at 3,600 RPM; the 65,000-kW and 150,000-kW units at 1,800 RPM.

Of generators not superposed, mention may be made of the 1,800-RPM, 65,000-kW machine for the Cincinnati Gas and Electric Company. Steam conditions are 650 lb., 900 deg F. and one inch back pressure. The generator is hydrogen cooled. Another very large unit installed in 1938 was the 75,000-kW single-cylinder turbo-generator for the Delray Station of the Detroit Edison Company. It operates at 815 lb., 900 deg F., one inch back pressure. The speed is 1,800 RPM.

Another leading manufacturer reports very similar developments. Of eight units larger than 30,000 kW, totalling more than a third of a million kilowatts, added during the year to the country's steam-driven generating capacity, four are hydrogen cooled and six run at 3,600 RPM. The largest 1,800 RPM machine of the year is a 75,000-kVA hydrogen-cooled unit for the Duquesne Light Company at Pittsburgh. Located in a station that suffered from a serious flood a few years ago, this machine has been made flood-proof at standstill by provisions for completely enclosing it and applying gas pressure. The same manufacturer reports as the largest high-speed (3,600 RPM) generator of the year, a 58,825-kVA unit for the Philadelphia Electric Company, and among air-cooled machines one of 68,800 kVA, 1,800 RPM for the Duke Power Company.

The advantage claimed for superposition is that it enables the capacity of a power plant to be increased by 40 to 100 per cent. and at the same time to obtain an improvement of 35 to 50 per cent. in heat rating. Hydrogen cooling is of advantage in high-speed machines because it reduces friction and windage to one-tenth of the amount in air, resulting, it is stated, in a saving of 1 per cent. at full load and 4 per cent. at quarter load.

Water-wheel Generators

Heretofore the record size of hydro-electric generators has been 82,500 kW. That is the rating of the units at Boulder Dam, which are 40 ft. in diameter. Drawings are now being made for generators of much larger size for the Grand Coulee development. These are to be rated at 108,000 kVA at 100 per cent. power factor and are to measure 48.5 ft. across. The weight—960 tons total, of which 540 tons is for the rotating element—will exceed only slightly that of the Boulder Dam generators. These machines are to go into service in 1941. They will turn at 120 RPM, will operate at 13,800 V and are to be cooled by air in a closed re-circulating system.

Electrical Manufacturing

Electrical manufacturing in the United States is highly developed and of large magnitude. The latest available statistics are those of the national census of manufacturers for 1937. The group designated as "Electrical machinery, apparatus and supplies" comprised 1,435 establishments, employed an average for the year of 257,660 wage earners, paid $355,958,610 in wages, and produced goods valued at $1,622,098,291. This is equivalent to nearly $13 per head of population. Plants with annual production valued at less than $5,000 are excluded because they account for a negligible portion of the national output.

Values of the larger items—in millions of dollars—were as follows:—Generators and motor-generator sets, 94; motors and motor parts and supplies, 174; control apparatus, 47; transformers, induction voltage regulators and current-limiting reactors, 92; switchboards, circuit-breakers and switches, 89; measuring instruments, 41; lamps and vacuum tubes, 82; household apparatus and supplies, 112; insulated wire and cable and armoured conductors, 245; telephone and telegraph apparatus, 116; batteries and battery parts and supplies, 103.

Although the census reports more than 1,400 establishments, by far the larger share of the industry is comprised in a small number of companies that cover the field broadly and some others engaged in the manufacture on a large scale of specific products such as measuring instruments, transformers, motors, line material and household appliances.

The nation's requirements of electrical goods for industrial purposes, power supply and distribution, household appliances and other uses are so fully met that a market for imports is practically non-existent. Imports of electrical machinery and apparatus in 1938 were valued at only $2,019,133, according to information received from the Department of Commerce. Exports were fifty times as great, $102,151,152, but even at that they were only 7 per cent. of the value of products manufactured as reported for the preceding year.

Appendix on Central America

South of the United States are the Republic of Mexico and the five small countries of Central America. The information that follows is based on reports of the United States Department of Commerce during recent years.

Mexico has an estimated population of 18,852,000 and an area of 760,290 sq. miles. Agriculture is the chief occupation but the value of agricultural products suffers in comparison with the production of industry and mines. The total generating capacity as at June 30th, 1936, was 628,980 kW, of which about 60 per cent. was hydro-electric. Plants engaged in the sale of current commercially account for 457,409 kW, or nearly three-quarters of the total; plants operated by private organisations for their own uses had 102,650 kW and the remaining 68,921 kW was in mixed plants, which sell some energy to the general public. It is stated that the present generating capacity is not sufficient for the needs of the country and that additional capacity of from 25,000 to 35,000 kW should be installed each year.

Since there is virtually no electrical manufacturing industry the country's requirements are necessarily met by imports, predominantly from the United States, with Germany a poor second in most lines. The value of these imports of electrical machinery, apparatus and supplies in 1937 approximated 25,000,000 pesos ($7,000,000), well distributed among the various kinds of goods. Customs classes are so numerous that it is impossible to make a brief summary. For example, the duty on electric tranformers weighing each up to 100 kg. is 0.40 pesos (the peso is valued at 28 cents) per kg.; on larger ones it is 0.09 pesos; apparatus forming a complete installation is free.

Selling Methods

Leading manufacturers of electrical appliances and equipment in the United States have branch headquarters in Mexico City and branches in the larger cities. Distribution is obtained also through the commercial departments of the larger power companies. Some have established local distributors for appliances. As to heavy equipment, it is stated that the power companies, mines and larger industrial concerns have, as a rule, purchasing agencies in the United States, but orders are placed through locally established sales branches of United States manufacturers. Market prospects must be viewed in the light of internal conditions in Mexico.

The five small countries that constitute Central America are of minor importance electrically and may for convenience be considered together. They have an aggregate population of 6,500,000 and an area of about 180,000 sq. miles. Agriculture is the principal occupation of the people, whose purchasing power is small. There is but little manufacturing of any kind and no electrical manufacturing. Total electrical imports in 1936 amounted to $779,652.

Of Guatemala (population 2,420,000) it is stated that the demand for industrial items is so small that orders are generally filled from catalogues. Abundance of water power enables large plantations to have their own small hydro-electric plants. It is apparent, however, that there is a market for electrical goods, though not a large one, since imports in 1937 were valued at nearly $300,000 of which 71 per cent. came from the United States, 26 per cent. from Germany and the remainder from other countries.

In Honduras the largest market for industrial electrical apparatus is in the foreign-owned fruit and mining companies. The equipment is bought by purchasing agents in the United

(Concluded at foot of next page)

PERSONAL AND SOCIAL

Information regarding new appointments and other matters of interest for this page are welcomed

MACCLESFIELD Electricity Committee has decided to retain the services of **Mr. L. C. Grant** as consulting engineer for a further period of six months, at a fee of 500 guineas, with a 4 per cent. charge on capital expenditure on new works under his supervision. Applications are to be invited for the appointment of chief engineer and manager of the electricity undertaking at a salary of £945 rising to £1,080. The Electricity Committee has deferred consideration of an offer by Mr. H. Howard, senior, to act in an advisory capacity for a period after the electricity undertaking has been taken over by the Corporation from Electricity Co. of Macclesfield, Ltd.

Miss Grace Spencer Banks was married on September 2nd, at Hale, to Mr. G. St. Claire Darlington. Miss Banks, who is well known to many in the electricity supply industry, is the only daughter of Mr. A. H. Banks, the industrial adviser for the Employers' Organisation of the National Joint Industrial Council for the Electricity Supply Industry.

Mr. H. Taylor, boiler house superintendent at the Luton Corporation electricity works, has retired after thirty-eight years' service with the Corporation.

Mr. A. S. Ward, who was elected Master Cutler of Sheffield, on September 4th, is the son of the late Mr. H. Ward, of Birley Carr, and a nephew of the late Mr. T. W. Ward and of Dr. J. Ward, both former Master Cutlers. He commenced his business career with Thomas W. Ward, Ltd., of which he is now joint managing director. At an early age he came to London to promote the business of Thos. W. Ward in the southern area, and subsequently established and developed the Silvertown and Grays works. In 1922 he returned to Sheffield to take part in the administration of the company. He is engaged in the direction of a large number of associated and subsidiary companies. Mr. Ward was the first president of the London Scrap Iron, Steel and Metals Association, was chairman of the British Shipbreakers' Association, and for several years was a member of the General Waste Materials Reclamation Board.

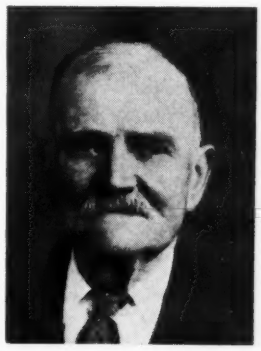
Mr. A. S. Ward

Mr. F. Tonge, of the staff of the Swinton and Pendlebury Electricity Department, has been appointed assistant mains engineer with the Ealing Electricity Department.

A pleasant ceremony took place on August 31st, at the St. Neots Electricity Offices of the Bedfordshire, Cambridgeshire and Huntingdonshire Electric Co., when Mr. H. J. Smith, the district manager, presented a cheque to **Mr. C. J. Cobbold** from the management of the company in recognition of his success in securing distinction in the E.D.A. salesmanship examination held in April. In making the presentation Mr. Smith congratulated Mr. Cobbold on his achievement. Mr. Cobbold was one of two candidates to obtain this honour in the examination which was open to all England.

Mr. A. I. Belisha has joined the board of the British Vacuum Cleaner & Engineering Co., Ltd.

Mr. J. Berry can claim that he is one of the oldest employees in the electrical industry. At the age of eighty he still continues to serve Walsall Conduits, Ltd., and despite a working life of sixty-five years has repeatedly refused the offer to retire on pension and steadfastly sticks to his job. The company is as proud of his pertinacity as he is to serve.



Mr. J. Berry

Mr. P. J. Robinson, city electrical engineer at Liverpool, has consented to remain in charge of the city electricity undertaking until the end of hostilities. The appointment of a successor will, therefore, be deferred indefinitely.

Mr. A. Goodsell, of the Weald Electricity Supply Co., Ltd., Hawkhurst, Kent, who was recently married to Miss Mary Shellam, has been presented by the staff with two armchairs. The presentation was made by Mr. E. Coomber, on behalf of Mr. H. W. Sears, managing engineer.

American Developments (*Concluded from previous page*)

States. Imports were $152,000, almost all from the United States.

El Salvador, with 1,550,000 people, is the most densely populated of the Central American countries but uses very little power—only 16,164 HP. The leading power company is controlled from Montreal, consequently equipment is bought through Canada. Imports in 1935 were $79,300 of which 50 per cent. came from the United States, 39 per cent. from Germany, 7.5 per cent. from Great Britain and 3.5 per cent. from other countries.

Nicaragua's imports of electrical machinery are negligible, being valued at $9,165 in 1936. Imports of "electrical utensils" in the same year were worth $126,335. In the same year Costa Rica's electrical imports were valued at $116,969 of which 66 per cent. came from the United States, 31 per cent. from Germany and 2 per cent. from Great Britain. The country has one major and four minor electric power companies with a total of 43,821 kW.

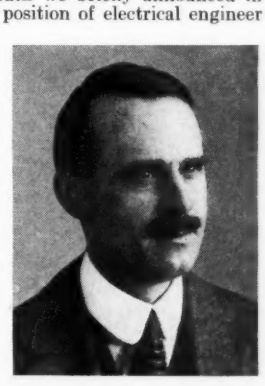
To sum up, it appears that electric power developments in Central America are quite small; that they are in large part foreign-owned, by companies which have offices in the United States and Canada and have purchasing agents in those countries; and that the low purchasing power of most of the population severely limits the sale of domestic appliances

OBITUARY

Mr. J. H. N. Dalton, of Brighton, whose sudden death, at the age of fifty, is announced, was one of the first wireless operators and was associated with Marconi in the early days of wireless telegraphy. He retired some years ago.

Mr. F. H. James.—A funeral service was held at Farncombe Church, Surrey, on September 6th, for the late Mr. Frank Henry James, deputy chairman and managing director of the Imperial Continental Gas Association, chairman of the East Anglian Electric Supply Co., Ltd., and the Urban Electric Supply Co., Ltd., and vice-chairman of Edmundsons Electricity Corporation, Ltd. Among those present were a number of men prominently associated with the electrical industry.

Mr. J. R. P. Lunn, whose death we briefly announced in our last issue, retired from the position of electrical engineer and transport manager to Darlington Corporation in 1937 owing to ill health. He went to Darlington from Huddersfield, in 1900, and gave the town its first electricity supply in the same year upon the completion of the generating station. He was responsible for the electric tramways which were inaugurated in Darlington in 1904, and supervised the change-over to trolleybuses which took place in 1926. The electricity undertaking proved a success under his direction, its costs and charges being among the lowest in the country. The funeral took place on Monday last at the West Cemetery Crematorium, Darlington and was attended by the Mayor of Darlington (Councillor J. Dougill), and members and officials of the Darlington Town Council. There were also representatives of various north-eastern electricity undertakings and electrical companies.



[*Elliott & Fry.*

The late Mr. J. R. P. Lunn

Mr. F. T. Kaelin.—The death occurred recently in Montreal at the age of sixty-five of Mr. Frederick Thomas Kaelin, consulting engineer to the Shawinigan Water & Power Co. Born in Switzerland, he began his career with the Brown, Boveri Co. He went to Canada in 1905 to join the Shawinigan Co., and from 1919 to 1930 he was the company's chief engineer. He was the inventor of the electric boiler bearing his name which is used in the pulp and paper industry.

Mr. J. G. Gunter.—The death occurred on September 8th at Ewell of Mr. John George Gunter, deputy solicitor to the Central Electricity Board.

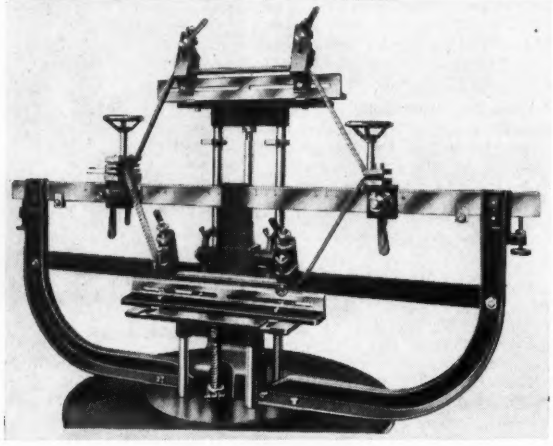
NEW ELECTRICAL PRODUCTS

A Review of Equipment Recently Marketed

Coil Winding and Forming

FOR rapid coil winding and forming the MIDLAND DYNAMO Co., LTD., 64, Belgrave Gate, Leicester, has produced the "Quickway" machine which coils the wire tightly round a vertical axis so that coils so made fit into less space. Each turn is proportioned, the same as coils made on fully shaped formers, and fracturing of insulation is avoided.

This machine winds and forms any size of coil made with covered wire, and any number of wires can be wound and formed together. Square, round, or rectangular conductors can be used, and winding is simplified because however many



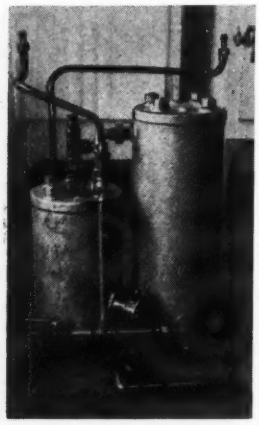
"Quickway" coil winding and forming machine

wires are used, they unite in a solid group automatically. By varying the base angle on which single or multiple wires are coiled, the relative length of each turn of wire is automatically proportioned, so compensating all tendency for the wire to disunite when moulded to the final contour.

Coils of other than standard diamond shapes can be made on the standard machine, using specially designed parts to suit customers' sample coils. Wire is used from drums arranged on a frame and the tension on each wire is adjustable.

Under-basin Water Heaters

A new type of water heater for sinks and bedroom basins, known as the "Paxon," is being supplied by the SUN ELECTRICAL Co., LTD., 118, Charing Cross Road, London, W.C.2.



"Paxon" water heater

Under each basin two galvanised cast-iron cylinders are installed. One acts as a pressure storage tank and receives the cold water. It also supplies a second small cylinder which is electrically heated and supplies the hot water tap.

The equipment can be attached either to existing storage tanks or to the mains, for it will withstand a pressure of 100 lb. per sq. in. When a storage tank is used it must be at least 15 ft. above the basin.

The standard sizes are 1½ and 3 gal. with loadings of 750 and 1,000 W, respectively. The cylinders, when installed, are enclosed in a cupboard.

Industrial Lighting Units

New industrial concentrating units for lighting horizontal and vertical surfaces from an oblique angle are announced by the WESTINGHOUSE ELECTRIC AND MANUFACTURING Co., Norfolk Street, London, W.C.2. This type of supplemental lighting is useful for fine assembly work, inspection, spray booths, exact machine work, or for paint shops.

The unit consists of an aluminium reflector, porcelain socket assembly, cast-aluminium socket housing and an aluminium swivel-mounting bracket for ½-in. conduit mounting. It employs a one-piece reflector with a diffusing reflecting surface treated by the Alzak process for a highly efficient, easily cleaned finish.

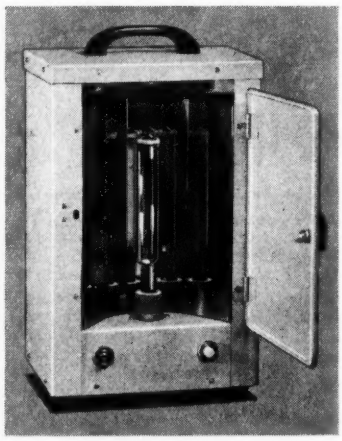
Heat-resisting glass lenses, either plain or heavily stippled, are supplied. Lenses are held to the reflector by a split holding ring with self-spreading lug to facilitate removal.

Cabinet Ultra-violet Lamp

A cabinet type sun lamp of advanced design has been introduced by D. M. LUMSDEN, Millburn, Almondbank, Perth.

The case comprises an enclosed metal cabinet with a hinged door to protect the quartz burner, and a special compartment holds the flexible cable and goggles. The quartz burner is of the gas-filled electronic discharge type giving an intense radiation so that only a short exposure is necessary.

Starting is automatic, though a press-button switch is also provided. The scientifically shaped reflector gives an even field of radiation over a tall person without the need for an adjustable reflector. Ripple finish is standard and each lamp is supplied complete with 10 ft. of cable.



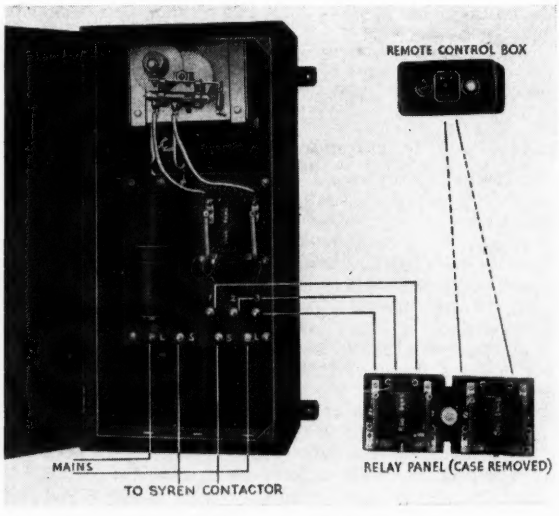
Lumsden cabinet sun lamp

Disc Thermostat

A disc type thermostat has been developed by SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, Salford, 3, for electric irons, the element being in the form of a dished bi-metallic disc on which the insulated silver contacts are mounted. The thermostat has a snap action to prevent arcing. The unit is adjustable, completely self-contained, and may be supplied with a supplementary heater to reduce its differential. Owing to the form and construction of the thermostat, in the event of a failure it is not necessary to return the complete iron to the makers, as a new thermostat may be inserted immediately.

Remote Control for Sirens

For use in A.R.P. work, KLAXON, LTD., 201, Holland Park Avenue, London, W.11, have introduced siren control gear for remote operation. It is capable of controlling any number of sirens from central stations over distances of up to about 10 miles.



Klaxon siren control equipment

The method of installation is shown in the illustration. The wailing control with relay panel should be mounted in the vicinity of the siren, and the wiring between this and the siren is energised at mains voltage. The pair of wires from the remote-control box is energised by battery or other source of low-voltage DC supply adjacent to the control box, and the wires from this to the relay panel may be telephone cable.

The siren is operated by an ordinary contactor. It is only necessary for the attendant to set the selector switch according to whether the wailing or steady signal is required, and press the white button. This will start the siren, which will be automatically stopped by a cut-out switch in the wailing control after a period of two minutes.

Rapid Water Heater

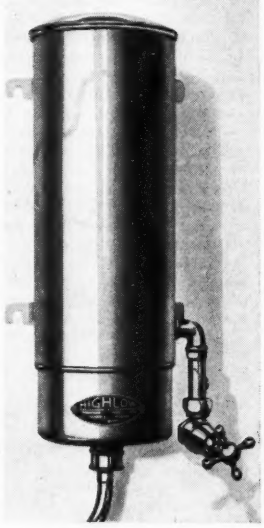
A one-gallon rapid type water heater is a completely new product of ARCHIBALD LOW ELECTRICS, LTD., Newarthill, Motherwell, Lanarkshire.

The equipment is designed to give small quantities of hot water quickly and is made of copper spun from a single sheet. A lift-off lid is provided.

The thermostatically controlled element is of the loop rod type and the control valve, pressure reducing valve and non-return arrangement are provided on the cold water inlet. The hot water outlet is of the swivel type with a radius of 9 or 12 in. and brackets are provided for wall fixing.

The whole equipment is tinned on the inside and chromium plated externally. The heater, which has a capacity of one gallon is loaded at 3 kW and will raise one gallon of water through 50 deg. F. in about three minutes.

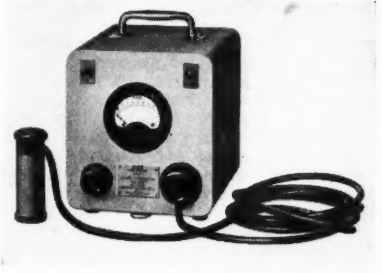
The dimensions of the unit are 6 in. in diameter and 18 in. high, the fixing centres being 10 in. vertical and 7 in. horizontal.



"Highlow" rapid water heater

Layer Thickness Meter

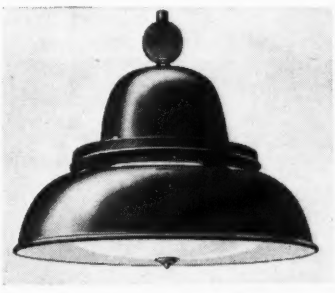
A layer thickness meter made by the SALFORD ELECTRICAL INSTRUMENTS, LTD., Peel Works, Silk Street, Salford, 3, is available in three models according to the nature of the layer to be measured. It is intended for measuring the thickness of non-magnetic coatings on magnetic bases, but there is another model for the measurement of nickel plating (a magnetic coating) on non-magnetic bases. In this case the design is somewhat different, the functioning of the instrument depending upon the variation of the reluctance of the transformer magnetic circuit with varying thicknesses of nickel.



Salford layer thickness meter

Combination Lighting Fitting

A lighting fitting has been specially designed by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for accommodating "Osira" high-pressure mercury vapour and "Osram" lamps. It is suitable for housing one 125-W "Osira" lamp and two 100- or 150-W discharge lamps, or alternatively one 80-W "Osira" and two 75-W or 100-W tungsten lamps. The light is blended by the diffusing glass globe, and the resultant illumination is of a pleasing "daylight" quality and suitable for general industrial and commercial use.



G.E.C. lighting fitting for housing discharge and tungsten-filament lamps

The unit is constructed of a pressed steel vitreous enamelled reflector and canopy with a terminal box at the top for ¾-in. conduit or hook suspension. It is fitted with two two-slot and one three-slot b.c. lampholders. The diffusing glass globe totally encloses the lamps and is fixed to the reflector skirt which is secured to the canopy by screws giving easy accessibility to the lamps.

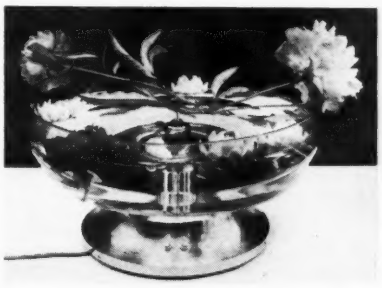
Table Fountain

An unusual and attractive illuminated table fountain is the latest development of STOKES APPLIANCES, LTD., 28/32, Chandos House, Buckingham Gate, London, S.W.1.

It comprises a glass bowl 16 in. in diameter mounted on a chromium-plated base. Within the bowl is an electric fountain operated from a transformer built into the base of the appliance.

Two 30-W lamps are also contained within the bowl and these are particularly effective when amber or other colours are used in conjunction with an array of cut flowers.

Two push-button switches are provided in the base of the bowl to enable the lamp and fountain to be controlled independently.

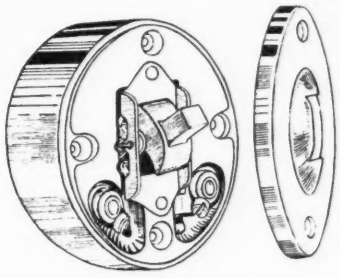


Stokes table fountain

Small Tumbler Switch

A simple robust tumbler switch with a projection of only 1¼ in. from the wall to the dolly tip is the latest introduction by J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, 11.

The switch is known as the "Cadet" and has contours free from dust collecting crevices. The dolly is moulded and specially strengthened and the stops limiting angular movement are metal to metal. The spring has a particularly low stress factor and the bearings consist of spindles rotating in round holes. Riveting has been avoided by employing special anchoring for the main bearing spindle, and the suspension of the complete mechanism for a metal bridge of one-piece construction ensures accuracy of alignment.



Tucker "Cadet" switch

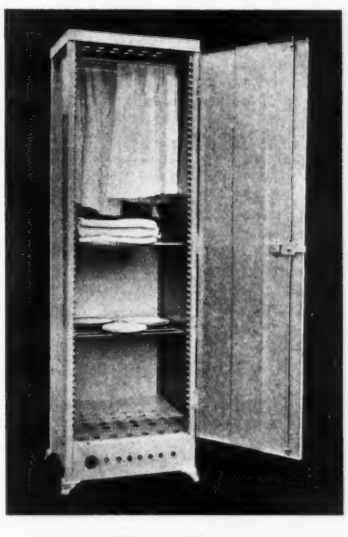
With regard to performance, the manufacturers state that the switch is able to carry the specified current (5 A) for half an hour without a voltage drop exceeding 0.05 V and temperature rise over 20 deg. C., the test results being in excess of the B.S. minimum requirements. After completing 12,000 operations at the load stipulated by the B.S. minimum requirements the test was carried on up to 100,000 makes and breaks.

Drying Cabinets

The latest drying cabinet of J. GLOVER & SONS, LTD., 39, Groton Road, Earlsfield, London, S.W.18, is a low-priced multi-purpose unit constructed of heavy-gauge mild steel sheets with a ground coat of enamel specially baked on and finished in aluminium.

Three racks are included and these are adjustable in 60 different positions one inch apart, extra racks being available if they are required by the purchaser.

A three-heat switch controlling a 2¼-kW heating element provides for airing, slow drying, and quick drying. The overall dimensions of the cabinet are 6 ft. high by 1 ft. 10 in. wide by 1 ft. 6 in. deep, the interior measuring 5 ft. 6 in. by 1 ft. 8 in. by 1 ft. 5 in., respectively.



Glover dryer

NEW BOOKS

Effects of Power Factor. Cathode Rays. Radio Servicing

Electrolytic Condensers. By PHILIP R. COURSEY. 2nd ed. (Pp. 190; figs. 112.) Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price: 10s. 6d.

When one considers the importance of condensers of the electrolytic type in radio and allied branches of electrical work, it is surprising that the literature on their properties, construction and uses is so sparse. The first edition of this manual, published in 1937, was about the first British work to deal with the subject as a comprehensive whole. The second edition runs to 190 pages, and has been fully revised, where necessary, in the light of new knowledge, methods of manufacture, and uses of electrolytic condensers.

At the present time there is a general tendency towards the use of smaller condensers—and consequently the etched form of construction, together with surge-proof and "wet" types of component, come in for fuller treatment in the new edition. The first chapter emphasises the differences between electrolytic and other forms of condensers, and deals with the equivalent electrical circuit of an electrolytic condenser. In the second chapter, mainly historical, the author mentions that although the component as we know it is comparatively recent, Wheatstone in 1855 discovered that an insulating film could be formed on the surface of a metal electrode. It is also pointed out that there is a parallel between the development of the "dry" electrolytic condenser, and the "dry" cell.

If the book throughout seems to stress the practical constructional side to some extent, it is probably because the author is connected with one of the largest condenser manufacturers; in any case, this cannot be said to be a disadvantage, for the information thereby included would otherwise never become available to the reader. The manual is surprisingly comprehensive in its scope, largely avoids the use of mathematics, and should commend itself to the general reader as well as to the specialist.—W. E. M.

Power-Factor Economics. By P. L. ROGERS. (Pp. 143; figs. 30.) Chapman & Hall, Ltd., 11, Henrietta Street, London, W.C.2. Price: 12s. 6d.

This book consists largely of data and worked examples, with comparatively little in the way of fundamental treatment or general principles. It was, therefore, not very suitable for transplanting from the land of its origin, America. About sixty of its 140 pages consist of tables giving trigonometrical ratios, currents and losses of motors and transformers, condenser sizes, and wire data. Since all the plant is for 60 cycles, the wire tables are American, and the angle data is common property, this material is of little use to those practising in this country. Moreover, the subject of conductor losses and voltage drops is treated in a somewhat *ad hoc* manner with the result that 68 separate formulæ are required to express the effect of power factor in the different arrangements of circuit.

This said, however, the book must be commended as a "window" giving an excellent outlook over the general field of power factor economics on the utilisation side, and the types of problem to be met with. A number of examples are worked through in detail, and whatever may be said of their data, their methods are of general application and are clearly and logically set out. While most of the book deals with the situation as it presents itself to the power user, there is a short final section which treats of the use of condensers by the supply undertaking.—D. J. B.

Cathode-ray Tubes. By M. VON ARDENNE. (Pp. 530; figs. 465.) Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price: 2gn.

About six years ago a book on this subject by Von Ardenne appeared in German. Such a book, by one of the leading workers in this field, was a great acquisition to those of the technical public who have a reasonable acquaintance with the German language. Three years later the preparation of an English edition was undertaken and we now have the result, which is an extremely valuable addition to the English literature on this subject.

In order to bring the contents into line with the enormous progress which has been made in the technique in these three years the German author says that he has devoted a considerable amount of time to rewriting and altering a large portion of the book, with the result that we now have available in English an up-to-date account, so far as this is possible, of progress in this field.

The scope of the book is practically confined to the so-called low-voltage tube permanently sealed off, though naturally where principles are dealt with much of the material can be applied to other forms of cathode-ray oscillographs.

The book is divided into sections on the cathode-ray tube, accessories, auxiliary equipment for making measurements, and the cathode-ray tube as an operating unit. Two sections appear to the reviewer to be outstanding in their merit: first, the contribution on the subject of fluorescent materials and screens is really excellent, as it not only collects a considerable quantity of material from the scattered literature of the subject, but also it is clear that the author is speaking from first hand knowledge of his subject; and secondly, the chapter dealing with the equipment for making measurements.

Minor criticisms are that a standard practice should be adopted in the presentation of all oscillograms in which the horizontal indicates time variation. Also English and American references might well be strengthened in a future edition.—J. T. M.-M.

Principles and Practice of Radio Servicing. By H. J. HICKS. (Pp. 305; figs. 212). McGraw Hill Publishing Co., Ltd., Aldwych House, Aldwych, W.C.2. Price 18s.

The tracing and cure of faults in radio receivers can only be successfully accomplished by logical deduction and to do this the operator must have a sound knowledge of radio design. Moreover, this knowledge must be of a practical type, matters of pure design being of less importance than a ready appreciation of the relative vulnerability of various components.

In this work the author, an instructor at an American vocational school, has collected a large amount of information on modern radio practice and the first twelve chapters take the reader from the fundamentals of electricity to the complexities of the modern superheterodyne receiver. The treatment is severely practical and the purist will quarrel with loose phraseology in many places, but the statements are, in general, accurate.

There is one chapter on servicing receivers, one on public address systems and one on how to conduct a servicing business, containing a number of commonsense points which are often overlooked. One feels that the value of the book is reduced by the absence of any logical plan of radio servicing. Much of the information contained in the 300 odd pages is of value, but it must be applied by the reader for himself. The numerous circuits and data on American methods will be found helpful in certain circumstances and there is a really comprehensive 13-page index. Whether the service engineer will consider this information worth the price is another matter.—J. H. R.

Engineering Drawing. By ARTHUR CRYER. Fourth edition. (Pp. 156; illus.). Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 5s.

This book is intended for mechanical engineering students, and comprises examples (for drawing) of mechanical details. In the present edition the notes on engineering materials have been rewritten and amplified. In the drawing examples the author has endeavoured to overcome the difficulties some students have of visualising mechanical parts by giving appropriate isometric sketches. He has also endeavoured to foster the imagination of the student and to compel him to think about what he is drawing, so that he may develop into a competent draughtsman and not a copyist. For this reason most of the examples are purposely left incomplete.

The bulk of the book is concerned with mechanical details and engine parts, and these occupy 42 plates, each accompanied by a page of notes and instructions. The notes on engineering materials occupy seven pages, and include such items as composition of ferrous and non-ferrous metals and alloys, heat treatment, working of metals, notes on design of component parts, &c.

There is an appendix of 27 pages of examination papers, and a further five pages of exercises (boiler details) for hand sketching and 127 questions involving sketching and calculations. Answers are not given to the numerical exercises.—A. T. D.

Shorter Notices

"Boiler Feed Water Treatment." By F. J. Matthews. (Pp. 319 illus.) Second edition. Hutchinsons' Scientific & Technical Publications, Paternoster House, London, E.C.4. Price 12s. 6d.

"A First Course in Mathematics for Technical Students," By P. J. Haler, M.Sc., and A. H. Stuart, Ph.D. (Pp. 295.) University Tutorial Press, Ltd., Clifton House, Euston Rd., London, W.1. Price 3s.—This is a third edition of a useful little book in which the practical side is kept well in mind. The authors claim in their preface that they have "endeavoured to ensure that the atmosphere of the workshop should pervade the whole book." The work ranges from measurement and decimal fractions to graphs of simple functions and graphical solution of equations, taking in some elementary geometry, logarithms and algebra on the way. Mathematical tables are appended and answers are given to the numerous test questions.

"Factory Lay-out, Planning and Progress." By W. J. Hiscox. (Pp. 195.) Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, W.C.2. Price 7s. 6d.

"Properties & Strengths of Materials." By J. A. Cormack, B.Sc., and E. R. Andrew, A.M.C.T. (Pp. 383.) Macmillan & Co., Ltd., St. Martin's St., London, W.C.2. Price 8s. 6d.

"L'Energie en France." (Pp. 130.) 20F. Libraire Sociale et Economique, 3, Rue Soufflot 3, Paris (5e).

COMMERCIAL and INDUSTRIAL NEWS

London Domestic Appliance Showrooms. A.R.P. Shelters for Key Personnel. New G.E.C. Branch Premises. Reserved Occupations. Electrically-operated Boot Factory.

Central Export Register

The National Service Department of the Ministry of Labour is still compiling, through the Institute of Export, a central register of export executives which will be used for meeting additional requirements, both in Government service and elsewhere, for persons with scientific, technical, professional and higher administrative qualifications. The Minister of Labour, in consultation with the Lord Privy Seal, has appointed an Advisory Council to control the general conduct of the register, and through committees representative of the various professions, to advise and assist in its use.

Enrolment on the central register implies that the persons concerned will be prepared to serve on appropriate work and to accept such suitable work as is offered to them, except where they are already engaged on work of greater importance from the point of view of national defence. Individuals who volunteer will be expected to accept offers of service made to them on behalf of or through the Government, but regard will and must be had by both sides to the circumstances affecting the volunteer when the offer is made. Enrolment on the register, however, does not mean that any guarantee is given that the services of a particular individual will be called upon by the Government.

British export executives over the age of 35 who are not members of the Institute but who are resident in the United Kingdom and would like to register under this scheme, should apply by letter enclosing 1½d. stamp for postage, to the secretary of the Institute of Export, 11, Aldwych, London, W.C.2, when full details of the scheme will be sent to them.

Export Licences

All communications for the Export Licensing Department, hitherto at 80-82, Pall Mall, London, should be made to Inveresk House, Strand, London, W.C.2.

Manufacturers' Agents

It is likely that several members of the Manufacturers' Agents' Association who may be called to the Services, will seek the aid of other manufacturers' agents who are not likely to be called up to assist in carrying on their agencies until such time as they are able to resume their business activities. Likewise, other members have volunteered to undertake to represent their fellow agents until they return from military duties. All arrangements made between the parties would have to be considered on their respective merits and be for such time only until the previous agent returns. It is requested that manufacturers and agents who may be affected in this way should apply to the Association.

Canadian-American Arbitration Commission

A *Reuter's Trade Service* message states that another big step forward in the friendly relations between Canadian and American business men is being taken this month with the first meeting, in Canada, of the recently formed Arbitration Commission, which will consider means of settling commercial disputes between business men of the two countries without resort to court litigation. The preliminary work of the new body at its initial meeting will be the drafting of an arbitration clause which, it is proposed, shall be included in contracts between commercial firms doing Canadian-American business.

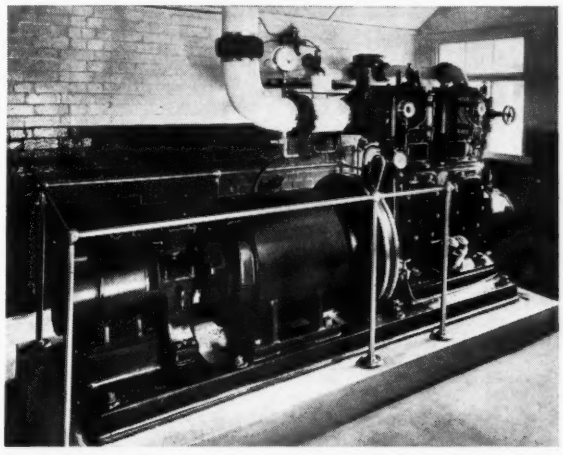
The new body will also set to work to choose a panel of arbitrators. The Canadian panel will be selected from industrial, business and professional groups, and will serve without compensation. Mr. W. H. Coverdale, of Montreal, president of the Canada Steamship Lines, Ltd., is chairman of the new Commission, and the members include: Dr. J. R. Angell, of the National Broadcasting Co., and Mr. J. S. Carson, vice-president of the American and Foreign Power Co.

New Westinghouse showrooms in Norfolk St., London, W.C.2

Back-pressure Set and Mains Supply

Process steam varying in amount from 700 to 1,700 lb. per hr. was required at a West Country works. As electric power was also needed a back-pressure engine driving an alternator was installed, steam being taken at 120 lb. per sq. in. and exhausted into the process steam main at 15 lb. No condensing water was available and a pass-out engine was therefore considered less suitable.

Since the maximum demands for steam and power could not be balanced the operation of back-pressure plant by itself would have resulted in steam being blown to waste or to a shortage of electricity. Arrangements were therefore made with the local supply undertaking to run the set in parallel with the 400-V, three-phase, 50-cycle public mains.



26-kW, AC generating set at a West Country works

The 40-HP two-crank back-pressure engine is equipped with a self-contained regulating gear which requires no outside supply and pressure water or oil. Fluctuations in pressure in the exhaust mains due to varying demands for process steam automatically determine the amount of steam admitted to the engine. The latter runs in synchronism with the outside supply, which makes up any deficiency in the electrical requirements.

The engine works without cylinder lubrication and the exhaust can therefore be used for water heating. Its guaranteed steam consumption is 42 lb. per BHP-hr., but we are informed that on test a measured consumption of 38.5 lb. was achieved.

The alternator is rated at 26 kW and is connected to a Verity's switchboard. The complete set was supplied by Ashworth & Parker, Ltd., to the specification of the consulting engineer, Mr. G. T. Champion.

New Domestic Appliance Showrooms

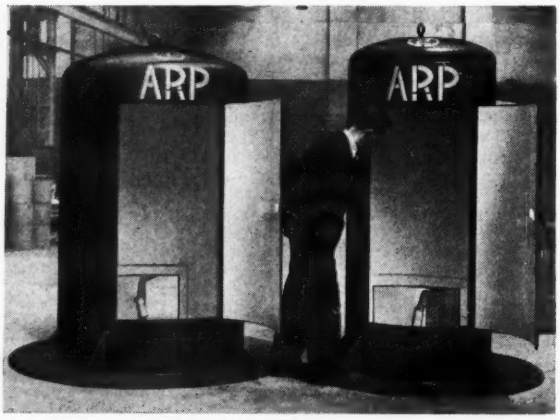
Despite the difficult times "Business as usual" is the slogan of many electrical concerns, and an instance of this is the recent opening by the Westinghouse Electric International Co. of a new showroom at its premises at 2, Norfolk Street, London, W.C.2. The new showroom is spacious, and is conveniently situated on the ground floor. The appliances shown include a complete range of Westinghouse domestic refrigerators, washers, dishwashers, semi-commercial refrigerators, and "Silver Arrow" irons.

Italian Output of Molybdenite

A message to *Il Sole* from Cagliari (Sardinia) states that the Italian output of molybdenite, the only industrially used ore of molybdenum, is at present only small, coming from the deposits at Gonnosfanadiga, in Sardinia, and the Bivongi zone, in Calabria, but the presence of molybdenite has been reported from other Italian localities, such as Traversella, Montorfano, Porto Ceresio, &c. *Reuter's Trade Service* reports that the annual consumption of concentrated molybdenum ore in Italy is about 800 tons and the Italian production in 1936 was 861 tons. Work at the Gonnosfanadiga and Bivongi mines has only recently been resumed.

A.R.P. Shelters for Key Personnel

The desirability of protecting switchboard attendants, boiler house men, mains control officers, &c., from falling masonry, blast and splinters during air raids has long been appreciated, and Cooke & Ferguson, Ltd., have been manufacturing for some time a shelter of the "pillar box" type, for this purpose. Constructed throughout in ¼-in. thick boiler plate, this type of shelter requires only a minimum amount of sandbags or brickwork to render it completely splinterproof. Further, the simplicity of design enables the shelter to be moved to any part of the factory by means of the eye bolts which are provided in the dome, and holes in the base-plate render it simple to bolt down the shelter when it is once in position; the sandbags can then be piled against it. An emergency exit is frequently incorporated in case there is any likelihood of the main door being blocked by falling masonry or steelwork. Construction throughout is by electric welding and a



A.R.P. shelters constructed by Cooke & Ferguson, Ltd.

test was recently carried out to satisfy the designers that the strength of the structure was sufficient to withstand falling débris. The shelter was mounted on steel joists set in the ground giving a minimum amount of resilience, while a solid concrete block weighing 38 cwt. was lifted above it to a height of 30 ft. Upon being released by a snatch block, the concrete block struck the shelter with a force calculated to be 101 tons. The dome successfully withstood this terrific hammer blow, and the welds in the structure remained intact, although the dome was dented. Furthermore, the main door and the emergency exit did not jam or show any tendency to do so, and were opened in the usual way immediately after the test. A person 6 ft. tall could still stand inside with 3 in. clearance between the top of his head and the dented portion of the dome. There is a range of pillar box shelters available, which provides shelter for two or three persons, four persons or six persons, the construction being identical in each case.

New Electric Furnace Works

Owing to the continued expansion of business the present works of Wild-Barfield Electric Furnaces, Ltd., have become inadequate to cope with the large number of orders. The company has purchased land for the erection of a modern factory with facilities to enable it to handle the increased output and at the same time to improve deliveries. In due course, the entire organisation comprising offices, works, research department and demonstration heat-treatment shop will be transferred. In the meantime manufacture will continue at the company's present works, but temporary offices have been taken to which designs and drawing offices, accounts, sales and executive departments have been transferred. All correspondence should for the time being be addressed to these temporary offices at 2-6, Highwood Avenue, Bushey, Herts. The associated company, G.W.B. Electric Furnaces, Ltd., has also moved its registered offices, accounts, "Eternite" and quenching oil sales departments to the same address, but all correspondence and inquiries relating to Gibbons-Wild-Barfield furnace designs, contracts, &c., should be addressed to Dibdale Works, Dudley, Worcs. The steps already taken will increase present manufacturing space to a certain extent.

Temporary Removals

The Synchronome Co., Ltd., has transferred its sales, service and contracts departments to its Abbey Electric Clock Works, Mount Pleasant, Alperton, Middx.

Unity Heating, Ltd., has offered office accommodation to the Electrical Industries Benevolent Association, the address of which is now, c/o Unity Heating, Ltd., Unity Works, Welwyn Garden City, Herts.

British Klöckner Switchgear, Ltd., has removed to 81, Guildford Street, Chertsey, Surrey.

The address of the Royal Society of Arts is, c/o Mr. Basil Ionsides, Buxted Park, Sussex.

E. G. Acheson, Ltd., are now conducting their business from their works office at Prince Rock, Plymouth (telephone: Plymouth 5593).

The address of the Institute of Marine Engineers is now, 73, Amersham Road, High Wycombe, Bucks.

The Western Electric Co., Ltd., has removed to 152, Coles Green Road, Cricklewood, N.W.2. (telephone: Gladstone 5401). Telephone numbers and addresses in connection with service remain unaltered.

The radio sales organisation of the Gramophone Co., Ltd., ("His Master's Voice") has been removed to Bournes Bridge, Hayes, Middx. (telephone: Southall 2468). The order department continues to function at 100, Blyth Road, Hayes, Middx.

The central administrative office of the London University is now at Royal Holloway College, Englefield, Surrey.

The temporary address of Mr. Frank Whitelegg is 90, Robinhood Lane, Sutton, Surrey (telephone: Vigilant 4143).

Watson & Sons (Electro-Medical), Ltd., are conducting their business from 76, Castle Street, Reading (telephone: Reading 3237).

Cancelled Events

The annual dinner of the Southern Division of the Electrical Power Engineers' Association, which was to have been held on October 7th has been cancelled.

The Northern National Radio Exhibition which was to have been held at City Hall, Manchester, from September 26th to October 7th, has been abandoned for this year.

The Midland Electrical Engineers' Ball which was to have been held on November 10th has been cancelled.

Kettering Radio Exhibition arranged for November 2nd, 3rd and 4th has been cancelled.

G.E.C. Showrooms at Hull

The new branch and showrooms of the General Electric Co., Ltd., at Hull, which were recently opened, provide an excellent illustration of the company's progressive policy. In 1911 a small stockroom was opened in Albion Street for the sale of lamps, electric light fittings, &c., but after two years it was necessary to find larger premises. A move was accordingly

New G.E.C. premises at Hull showing (left) the exterior and (right) one of the lighting fittings showrooms

made to George Street, where the business flourished to such an extent that in 1919 a further move was made to larger premises in the same street. These were occupied until this year, when a spacious new building containing showrooms, sales counters, offices and the like, was opened at Magnet House, Wright Street. The new branch possesses a ground floor and two upper storeys, the former being devoted to sales counters and receiving and despatch departments, and the first floor to showrooms and offices. The top floor contains stockrooms in which an adequate stock of all the standard products of the company are stored on steel shelves. The central display window on the ground floor gives plenty of scope for attractive window displays. It is illuminated by six "T.O.T." combination reflectors recessed into the soffit of the false ceiling. Each reflector has one 80-W "Osira" and two 150-W "Osram" lamps.

The showrooms are spacious and airy and include separate rooms for the display in suitable surroundings of modern and period lighting fittings, radio equipment, household appliances, electric cookers, water heaters, fires, and the wide range of accessories which the company manufactures. The display of lighting fittings is particularly comprehensive and designs suitable for the home, office, restaurant, cinema and theatre, shops and stores, factories, streets and docks are included. The sales counters are illuminated by seven totally enclosed fittings, having white opal globes and housing 200-W "Osram" lamps. The entrance lobby has one "T.O.T." pendant fitting.

Guides to Rationing

To explain how the new Fuel and Lighting Order affects electricity consumers and to help them to decide how best they can reduce their consumption by the requisite 25 per cent., the British Electrical Development Association will in the next few days be issuing a leaflet, which, besides showing how to read a meter, will detail the comparative consumption of various appliances and offer various suggestions for economies.

The too rigid cutting down of lighting is not thought necessary or desirable since the consumption for this purpose is relatively small and the same applies to such other apparatus as radio sets, vacuum cleaners, irons and refrigerators. Heating appears to offer the great scope for saving and a small restriction of water heating also has a big effect on the total consumption. Housewives are urged to plan their cooking so that their ovens and grill-boilers are used to full advantage, by preparing more than one dish at a time, by using residual and "warming-up" heat, and by making use of the proper flat-bottomed utensils. No more water should be boiled in a kettle than is actually required.

Explaining these suggestions to us, Mr. J. I. Bernard, chief technical assistant to E.D.A., said that most people would find that with the reduction in the size of lamps necessitated by the black-out, and with the reduction in the use of electric fires, there would be no difficulty in effecting the necessary economy. The Order could be considered a precautionary measure designed to avoid the introduction of more drastic measures later on.

A similar, very helpful, memorandum on the same subject has been drawn up by the Electrical Association for Women. The subject is covered from a number of angles and is introduced by a general statement regarding the nature of the rationing scheme.

Next the consumption of lamps and domestic appliances is stated to enable the reader to obtain some idea of the directions in which economy is possible. This is followed by a brief note on meter reading. The succeeding section deals, point, by point, with the saving of energy. It is recommended that the size of lamps should be reduced and that only efficient lamps should be used. Only one bar of an electric fire should be used wherever possible and fires should always be switched off when not immediately needed. The bowl fire is recommended for occasional use—except in kitchens and bathrooms.

Some notes on water heating draw attention to the need for the efficient lagging of tanks; the use of less water for baths; the adjustment of thermostats, &c. Wash-boilers and kettles are also covered and some guidance is given on the handling of refrigerators and small appliances.

With regard to cooking, the need for getting the most out of the oven is stressed and there are some useful notes on the operation of hotplates. The memorandum also sets out actual meals which may be entirely cooked (a) in an electric oven and (b) on a griller-boiler, and hints on the cooking of vegetables, &c., are given.

Copies of the memorandum may be obtained from the Association's headquarters, 20, Regent Street, London, S.W.1.

B.E.A.M.A. Dinner Cancelled

The British Electrical and Allied Manufacturers' Association announces that the annual dinner, arranged for November 16th, has been cancelled.

Trade Announcements

A. Bowman, electrical and radio engineer, 457, Chillingham Road, Newcastle-on-Tyne, has acquired the business of the Heaton Electric and Radio Service, Heaton Road, Newcastle.

The Scottish Industrial Stores, Ltd., electrical wholesalers, Glasgow, have removed their business from 21, York Street, to larger premises in the city at 120-124, Oxford Street.

Siemens-Schuckert (G.B.), Ltd.

Consequent on the outbreak of war Siemens-Schuckert (Great Britain), Ltd., Great West Road, Brentford, Middx., has severed all connection with Germany, and is now entirely under British direction. Mr. A. White has joined the board, and has been appointed managing director *pro. tem.* in order to effect necessary measures of reorganisation. Every effort will be made to minimise delay in the execution of contracts.

Belgian Foreign Electrical Trade

The appended table shows the Belgian imports and exports of electrical machinery, apparatus and cognate material during the six months ended with June last as compared with the corresponding half of 1938. For purposes of comparison, the totals in sterling have been added, the Belgian fr. having been converted at the par rate of 143¼ to the £.

	IMPORTS January to June		EXPORTS January to June	
	1938 (1,000 fr.)	1939 (1,000 fr.)	1938 (1,000 fr.)	1939 (1,000 fr.)
Generators motors and rotary convertors	26,653	22,794	8,174	9,795
Static transformers	6,190	4,665	6,810	8,325
Mercury rectifiers	711	185	40	81
Other dynamo-electric machines	4,390	3,312	9,704	5,783
Dry batteries	1,189	1,165	97	103
Accumulators and parts	1,697	1,068	2,228	1,902
Magnets, other than electro-magnets	2,151	1,036	14	—
Land and submarine cables	957	746	51,765	26,049
Insulated wires and cables	8,278	6,153	33,889	31,426
Carbons and electrodes	4,500	4,136	59	66
Porcelain insulators	3,032	1,252	237	418
Elec. globes, bulbs and glassware	4,590	4,402	4,240	2,323
Insulating tubes, junction boxes, etc.	1,311	901	970	745
Other insulating material	2,279	1,756	139	117
Arc lamps	64	72	2	—
Incandescent lamps	9,363	9,069	8,539	9,035
Elec. measuring instruments	12,757	11,355	1,831	1,826
Teleg. and teleph. apparatus	2,717	2,562	75,933	54,450
Radio receiving sets, complete	4,867	4,220	8,334	3,577
Radio receiving sets, partly assembled	362	710	4,782	5,661
Loudspeakers, microphones, etc.	1,874	1,317	507	936
Radio valves	9,761	6,830	655	372
Other radio material	4,815	2,660	989	655
Other electrical apparatus	85,883	64,894	14,840	13,704
Total fr.	200,391	157,260	234,778	177,349
Total at 143¼ fr. to £	£1,396,453	£1,095,191	£1,636,084	£1,235,882

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price Sept. 13th	Fortnight's inc. or dec.
a Acid oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£37	—
a Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
a Borax... ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac ... ... per cwt.	£4 8s.	—
a Sulphur, Commercial ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda, Chlorate ... ... per lb.	3¼d. to 3¾d.	—
a ,, Crystals ... ... per ton	£5 to £5 5s.	—
a Sodium, Bichromate, casks ... per lb.	4¼d. net	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£94	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil ... ... ,,	1/2½ to 2/9	—
p Babbits Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£107	—
Grade II ... ... ,,	£137	—
Grade III ... ... ,,	£73	—
c Brass (rolled metal 2" to 12" basis)... per lb.	8¾d.	—
c ,, Tubes, (solid drawn) ... ... ,,	1/0½ to 1/0½	—
c ,, Wire, basis ... ... ,,	9¼d.	—
c Copper Tubes (solid drawn) ... ,,	1/1½d.	—
g ,, Bars (best selected) ... per ton	£86	—
g ,, Sheet... ... ... ,,		
g ,, Rod ... ... ,,		
d ,, (Electrolytic) Bars ... ... ,,	£52	—
d ,, ,, Wire Rods ... ,,	£56 10s.	—
d ,, ,, H.C. Wire ... per lb.	8 5/8d.	—
f Ebonite Rod ½" dia. & up ... ... ,,	1/10 to 2/3	—
f ,, Sheet ⅛" thick & up ... ,,	1/4 to 1/8	—
n German Silver Wire, Nos. 1 to 12 ... ,,	2/4	—
h Gutta-percha, fine ... ... ,,	Nom.	—
h India-rubber, Para-fine ... ... ,,	9¼d.	1¼ inc.
g Lead, English Pig ... ... ,,	£18 10s.	—
g Mercury ... ... per bot.	Nom.	—
e Mica (in original cases) small ... per lb.	1/– to 2/6	—
e ,, ,, ,, medium ... ,,	7/6 to 15/–	—
e ,, ,, ,, large ... ,,	17/6 to 22/6 up	—
p Phosphor Bronze, plain castings ... ,,	1/2½	—
p ,, ,, drawn bars & rods ,,	1/1½	½d. inc.
p ,, ,, rolled strip & sheet ,,	1/0½	½d. inc.
p ,, ,, wire ... ... ,,	1/2½	½d. inc.
o Platinum ... ... per oz.	£10	£1 5s. inc.
d Silicium Bronze Wire ... ... per lb.	8¾d.	—
g Spelter ... ... per ton	£15	2s. 6d. dec.
g Tin, Block (English) ... ... ,,	£230	—
n ,, Wire, Nos. 1 to 16 ... ... per lb.	3/9	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g Henry Gardner & Co., Ltd.
h Edward Till & Co.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in this section under the same heading.

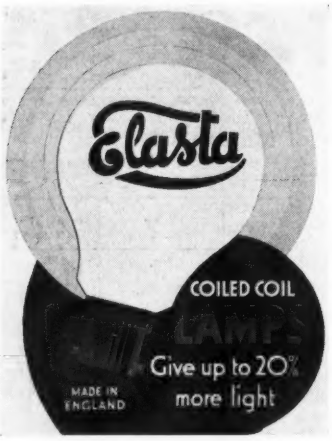
An Electrically Driven Boot Factory

A new boot factory has recently been completed for John White (Impregnable Boots), Ltd., and is the largest of the company's eight factories. The building contains a boot factory complete on one floor, and a bottom-stock department which has to supply the company's entire chain of factories. On the upper floor of two which total 30,000 sq. ft. of working space, the boot factory can produce up to 20,000 pairs of welted boots and shoes weekly. Equipment on the lower floor can supply soles, insoles and other bottom stock for 60,000 pairs weekly. A feature of the building, for which A. E. Richardson and Lovett Gill were the architects, is the steel roof which spans the entire floor area without vertical supports.

Electricity supply for the new factory is obtained from a private sub-station, incoming at 11,000 V and transformed to 365-210 V and a further supply is taken from the low-voltage mains. Each machine on the upper floor is driven by an individual electric motor, the only shafting being on the lower floor where the heavy sole-cutting presses are coupled to comparatively short lengths of shafting, each driven by its own electric motor. There are 258 electric motors in use, varying from ¼ to 25 HP. Machine heating is also by electricity (there are 65 process heating points), and all sewing machines are equipped with needle lights. Lighting equipment is by Benjamin Electric, giving evenly distributed light for the precise work undertaken, and there are twenty-four suspended fan heating or cooling units, thermostatically controlled. Arthur Sanders, Ltd., were the building contractors, and Mr. W. G. Timpson, of the Central Electric Co. designed the power and lighting installation.

Lamp Publicity

Pope's Electric Lamp Co., Ltd., is again issuing an attractive range of publicity materials for "Elasta" lamps. Illustrated catalogues and folders describe lamps for general and special lighting services and for automobile lighting. Showcards, cut-outs and counter literature holders are among the display material offered.



"Elasta" lamp cut-out

New E.C.A. Members

At a recent meeting of the E.C.A. Council a number of applications for membership were considered, and the following contractors were admitted to full membership: S. H. Nichols & Co., Ltd., Birmingham, 19; H. C. Vaughan, Cardiff; H. Farley Paine, Hastings; E. W. Butler, Wolverton; H. Cripps & Co., London, W.1.; E. Goldston, Ltd., Northampton; E. L. McKone, 53, Colney Hatch Lane, London, N.10; J. L. Shadwell, Kingston-on-Thames; Shepperson & Dooley, 291, Archway Road, London, N.6; F. R. Skeels, 91, Dover Road, London, E.12; G. H. Leggett, Highgate, Hawkhurst, Kent; F. Wise, Plymouth; F. R. Watkins, Newton Abbot, Devon; the Modern Electric Co., Maidenhead.

The following contractors were admitted to associate membership: Edward W. Salter & Co., Cardiff; the Peak Radio & Relay Services, Glossop.

New Catalogues and Lists

Falk Stadelmann & Co., Ltd., 83-93, Farringdon Road, London, E.C.1.—An illustrated leaflet, No. P. 2038/3940, including details of the new season's fires.

Revo Electric Co., Ltd., Tipton, Staffs.—A leaflet describing "IES/ARP 002" fittings just produced for low intensity lighting in accordance with BS/ARP 16.

Belling & Co., Ltd., Bridge Works, Southbury Road, Enfield, Middx.—The 1939-40 catalogue of electric fires and cookers, a new list of spare parts and a trade discount schedule.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A 72-page catalogue of surplus new and second-hand electrical material.

L. G. Hawkins & Co., Ltd., 30-35, Drury Lane, London, W.C.2.—The lighting and autumn issues of "The Link," containing details of the "Supreme" A.R.P. lamps, a new kettle and a heavy-duty hair dryer.

Rawlplug Co., Ltd., Rawlplug House, Cromwell Road, S.W.7.—An illustrated leaflet showing how Rawlplug devices can be used for fixing A.R.P. shutters, curtains, &c.

Revo Electric Co., Ltd., Tipton, Staffs.—A leaflet describing the new "Flushline" series cookers.

W. T. Henley's Telegraph Works Co., Ltd., Milton Court, Westcott, Dorking, Surrey.—A leaflet giving details of the company's new fire-resisting insulated cable.

Cambridge Instrument Co., Ltd., 13, Grosvenor Place, London, S.W.1.—Publication No. 150A dealing with Cambridge automatic temperature regulators.

The Edison Swan Electric Co., Ltd.—In referring to the folder dealing with "Ediswan Extra-Life" batteries in our issue of August 25th, the company's address was incorrectly given. This should have read 155, Charing Cross Road, London, W.C.2.

Information Department

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, &c., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, and occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following:—

HEATOVENT convector heaters.

We are keeping a register of temporary addresses which will enable us to answer inquiries regarding the whereabouts of concerns which have moved.

Reserved Occupations

Revised List

ON Friday last the Ministry of Labour published a revised list of reserved occupations, from which we have abstracted those relating to the electrical and allied industries. The figures in parentheses indicate the ages at which exemption starts. The schedule governs recruitment for full-time service only, and does not prevent anyone from undertaking part-time service, *e.g.*, in the many branches of civil defence.

Men

Accumulator maker, battery maker. (25)
Boiler coverer. (21)
Boiler shop, constructional iron works and shipyard workers (not specified elsewhere). (21-30)
Brass, bronze, aluminium, etc., turner, finisher, fitter and goods maker. (18-23)
Brazier. (23)
B.B.C. staff, administrative and executive grades. (25)
Carbon brush, crucible, arc lamp carbon manufacture. (30)
Clerical and office staff. (25-35)
Clerk of works. (30)
Constructional iron and steel work, fitter and erector. (23)
Coppersmith and copper goods maker. (23)
Draughtsmen. (21-25)
Electric lamp, radio valve maker. (21)
Electrical communications and signalling systems. (18-25)
Electrician, wireman, etc. (21-25)
Electricity generation (including generation at hydraulic power stations), transmission and distribution. (25)
Electroplater (except galvaniser and tinner). (35)
Enameller, japanner, lacquerer, etc. (metal and metal goods). (25)
Engineer (professional). (21-25)
Fitter, erector, etc. (electrical engineering). (18-23)
Fitters, etc. (21-23)
Fitter-assembler (motor, electrical, etc., engineering) (25)
Forgeman. (18-21)
Forgeman's helper, etc. (25)
Foundry worker. (18-25)
Galvaniser, tinner. (25)
Hand tool maker, edge tool maker. (23-30)
India-rubber, gutta-percha and waterproof goods (excluding oilskin) manufacture. (25-30)
Laboratory assistant. (25)
Lamp, lantern, oil-stove maker, assembler. (25)
Machinist (metal) able to set up. (18-21)
Machinist (metal) unable to set up. (25)
Machinist (miscellaneous metal goods). (25)
Metal annealer, hardener and temperer. (21)
Metal goods maker, assembler, odd worker. (25-30)
Metal manufacture. (18)
Metal polisher, bobber, mopper, etc. (25)
Mica-processing and micanite manufacture. (25-30)
Pattern maker (wood, metal, etc.). (18-25)
Plastic and plastic goods manufacture. (25-30)
Scientific, mathematical, optical, electrical, surgical, etc., apparatus maker. (18-23)
Assembler, scientific instruments and apparatus (including mathematical, surgical, electrical, etc.). (18-25)
Sheet iron worker, sheet metal worker, tinsmith. (18-25)
Stove, grate, range, refrigerator, radiator maker, assembler. (25)
Welder, burner and cutter. (21-23)
Wire rope, wire cable (including electric cable) maker. (21)
Wireless engineer, mechanic, etc. (30)

Women

The following list of occupations are those in which women are reserved (irrespective of age). It is pointed out, however, that any woman is free to undertake nursing or first-aid services, or may be accepted in any of the services of national defence for employment in her trade capacity.

Coil winder (light), bobbin winder.
Dry battery making.
Electro-plater (except galvanising and tinning).
Examiner, metal trade.
Gutta-percha goods manufacture.
India-rubber goods manufacture.
Inspector, metal trades.
Metal goods and metal furniture assembler (hand).
Mica processing and micanite manufacture.
Photo printer.
Plastics and plastic goods manufacture.
Press operator (hand or manual).
Stove, grate, range, radiator, refrigerator assembling.

ELECTRICITY SUPPLY

Hove's Hire Problem. Electric Baking in Manchester. American Gas and Electric Cooking Comparisons

Barnoldswick.—BULK SUPPLY ARRANGEMENTS.—In July the Electricity Commissioners held an inquiry into an application by the Yorkshire Electric Power Co. for consent to enter into an agreement for providing a bulk supply for the Barnoldswick Urban District Council, and into objections by the Nelson Corporation. The Commissioners have since informed the company that doubt existed whether it was competent for them to deal with the proposal under Section 21 of the Yorkshire Power Act, 1927. With regard to the estimates, it appeared to the Commissioners that in estimating the ratio between the statutory average maximum demand and the annual maximum demand, the Barnoldswick Council had not taken sufficient account of the form of the annual load curve in past years and the estimated rate of increase in the annual maximum demand. If an appropriate adjustment was made in the estimated ratio for 1940, the figures would show a small financial advantage to the Council in continuing to take a supply from the Corporation. The Commissioners had also borne in mind the other considerations advanced in support of the proposed arrangement, and if the company and the Barnoldswick Council so desired they would be prepared to entertain an application for approval of an arrangement for the giving of a bulk supply by the company under Section 19 of the Electricity (Supply) Act, 1919, a course which would make it unnecessary to pursue the question of the validity of the existing application. They suggested that the Barnoldswick Council should approach Nelson Corporation for a continuance of the bulk supply at present being given, pending a settlement of the matter, and at a meeting of the U.D.C. last week it was decided to do this.

Bolton.—POWER POINTS IN COUNCIL HOUSES.—The Housing Committee has arranged for the Electricity Department to install power plugs in houses on the Firwood estate.

Bradford.—CENTRAL CONTROL SYSTEM.—The A.R.P. Committee has approved a scheme by the city electrical engineer for the installation of the " Ripple " control system at a cost of £3,050.

Cardiff.—PAYMENTS TO CONTRACTORS.—The Electricity Committee has fixed the following amounts to be paid to contractors: Cooker wiring, standard run of 40 ft., 53s. 4d. (plus or minus 9d. per foot run over or under 40 ft.). Fixing and connecting cooker controls, 5s. Circulator and/or wash-boiler standard run of 40 ft., 40s. (plus or minus 9d. per foot run over or under 40 ft.). Fixing and connecting controls, plumbing circulator, fixing jacket, supplying and fixing connector box, 15s. Wash-boiler and thermal storage heater, fixing and connecting controls and/or switchplug, 2s. 6d.

INSTALLATIONS IN COUNCIL HOUSES.—A report by the city treasurer in regard to electrical installations in Council houses was recently considered by the Housing Committee which decided to continue the present system of charging rents to tenants for the installations and to transfer the deficiency to the general rate fund annually for the remainder of the period of nine years. In future, applications for additional heating points in houses which have already been provided with two points are to be made direct to the Electricity Department where they will be dealt with under the assisted wiring scheme.

Droxford.—HOUSE INSTALLATIONS.—At a recent meeting of the Rural District Council a letter was received from the Portsmouth electricity undertaking asking whether the R.D.C. would be prepared to wire the Council houses in Witherbed Lane. It was resolved to recommend that the building surveyor should be instructed to prepare specifications and obtain quotations for wiring the houses.

Eston.—BULK SUPPLY CHARGES.—At a recent meeting of the U.D.C. Electricity Committee the chairman reported that an offer had been made to representatives appointed by the North East England section of the I.M.E.A. by the North-Eastern Electric Supply Co. which would have the effect of reducing the charges at present paid by the Council for bulk supplies. Consideration of the matter was deferred until further particulars relating to the retrospective application of such revised charges are available.

Hove.—WITHDRAWAL OF HIRE SCHEME.—The Electricity Committee has had a report from the electrical engineer to the effect that since the evacuation of people from the London area commenced the Electricity Department has received numerous applications for the hire of appliances. Apart from the fact that it may have difficulties in obtaining additional supplies of cookers, water heaters and wash-boilers, these consumers will no doubt return to their own localities immediately hostilities cease and in consequence the Department will have been put to a considerable capital expenditure on wiring and appliances. Although the hire agreements provide for a minimum hire period of two years, or the payment of penalties, the collection of the latter are extremely difficult, particularly when consumers have left the town. He, therefore, recommended that for the time being, at any rate, the Department should cease to enter into agreements for the hire of new appliances, which should be sold only on hire-purchase terms, including wiring. By this means the Department would be protected by the Hire-Purchase Act and in addition would receive larger payments. He suggested that the hire-purchase terms, which would have to be worked out, should be consistent with those in operation in other undertakings. The Committee recommends the adoption of these proposals.

Manchester.—ELECTRIC BAKING.—Nearly 100 electric baking ovens are now installed in Manchester, and owing to the increase in the price of solid fuel the number tends to grow. The Corporation Power Sales Department keeps careful records of the electricity consumption of all bakers' ovens so as to be in a position to give accurate estimates of running costs for every class of oven when these are called for.

Mid-Cheshire.—DOMESTIC TARIFF AND EMERGENCY CONDITIONS.—The Mid-Cheshire Electricity Co., Ltd., has given notice to its consumers that it cannot consider amendments of assessments of domestic premises under the contract system, due to changes in the lamp connections brought about by emergency conditions. In the case of new connections, the assessment will be made on the existing basis, with a minimum which will depend on the size of the house.

Sleaford.—LOANS.—The Electricity Committee is applying for permission to borrow £1,400 for the change-over and £2,500 for mains and services.

Stretford.—ALL-ELECTRIC HOUSES BEING CONSIDERED.—The Housing Committee is considering the provision of some all-electric houses on the Barton estate, and has decided to obtain comparative costs involved in the provision of gas and electricity for consideration.

Switzerland.—NEW HYDRO-ELECTRIC PLANT ON THE RHINE.—In a recent issue of the *Bulletin* of the Swiss Association of Electrical Engineers details are given of a new hydro-electric power station which is being erected on the Rhine, at Reckingen, near the Swiss-German frontier, making the seventh plant of the kind below the Eglisau station. Operating under a head of between 23 and 39 ft. the plant will comprise two Kaplan turbines and alternators with a total capacity of 35,200 kW. The power will be stepped up for transmission from 11 to 50 kV at an outdoor transforming station. An annual output of 220 million kWh is anticipated.

United States.—COOKING STATISTICS.—In 1938, for the first time for six years, the improvement in the ratio of electric to gas cooker sales was halted, reports the *Electrical World*. In 1933 statistics compiled by the American Gas Association showed a ratio of fourteen gas to one electric cooker, and this ratio improved progressively, from an electrical point of view, to 3.5 to 1 in 1937. Last year the ratio was 3.7 to 1; to have maintained the 1937 ratio would have required the sale of some 15,000 more electric cookers. The Gas Association has also compiled data on the use of gas in residences constructed in 1938. The survey covered 56,672 dwellings, or approximately a third of all new houses built in the United States during the year, and of these 50,000, or 88 per cent., were said to be equipped for gas cooking.

(*Continued on next page.*)

I.E.E. National Service Register

THE central register for voluntary national service established by the Institution of Electrical Engineers is now in operation and those who have enrolled will be notified by the Ministry of Labour if and when their services are required. Members will assist by refraining from any action for the present other than notification of change of address, employment, or additional qualifications.

The Ministry is anxious that all sections of the register should be complete and volunteering members who have not returned the registration cards sent them on April 14th should do so immediately. Selection from the register will be carried out, on the advice of the Electrical Engineering Sub-Committee, only if a person is required for a post of greater national importance and only after advising the person's employer, whose representations will be taken into account.

In any event the Institution would like for its own records the red registration card, even if the member concerned is not able to volunteer. If registration cards have been mislaid, further copies will be supplied on request.

In view of the large number of branches and units of the Services requiring technical personnel, the Institution will probably not be asked to form a special technical unit as was done during the last war. Members who desire to enrol in one of the technical branches of the Services should, therefore, apply direct to the authorities for particulars.

Wallasey.—ENGINEER'S REPORT.—Introduction of the "continuous" system of meter readings resulted in a consumption of some 2½ million kWh not being included in the total sales for the past year, representing a deferred income of approximately £9,000, and there was a small decrease in sales as compared with the previous year (34.1 million against 34.9 million kWh). The financial result for the past year was also affected by the exceptional increase in the maximum demand (by 2,034 kW to 13,512 kW) during the intensely cold weather last December. In consequence of these factors and higher costs there was a deficit of £4,165 on the year's working, compared with a profit of £14,879 in the previous year. The income was £211,526 (£226,616) and working expenditure £173,299 (£162,071). Mr. B. T. Hawkins (electrical engineer and manager) explains that the decrease in the number of appliances sold on hire-purchase terms from 2,358 to 1,807 was chiefly due to less door to door canvassing by vacuum cleaner manufacturers; there was, however, an increase in cookers sold during the year from 190 to 209.

TRACTION

Cardiff.—TROLLEY-BUSES.—The Transport Committee is to obtain tenders for the supply of 60 trolley-buses, and is to ask Clough, Smith & Co., Ltd., to quote for the provision of the overhead line equipment necessary for the conversion of the tramway system.

Darwen.—TRAMS AND THE WAR.—Because of the war the Corporation's plans to scrap tram services by April next have had to be revised. On the Bolton Road section trams withdrawn at the beginning of this year are in service again, the reason being the need to conserve petrol. Peak period services will be maintained.

Liverpool.—TRAM SERVICE EXTENDED.—The Passenger Transport Committee has decided to extend the Prince's Park Gates to Pierhead tram service over the whole of its original route from Croxteth Road to Pierhead. This arrangement will continue for the duration of the war.

London.—REASON FOR CLOSING TUBE STATIONS.—On Tuesday the Ministry of Information issued a statement explaining why it had been necessary to close certain tube stations. The London Passenger Transport Board, it said, had been compelled to take precautions to eliminate the risk of any sudden flooding of the tube tunnels through the bursting of water mains or sewers where these passed through or were adjacent to the Board's stations. Certain protective works were temporary only, and it might be possible to reopen some stations; others would have to remain closed indefinitely.

Manchester.—REVIEW OF TRANSPORT POLICY.—At the meeting of the City Council last week the chairman of the Transport Committee (Councillor J. S. Hill) assured Alderman L. Cox that at its next meeting the Committee would review the new situation that had arisen as a result of the war with regard to the scrapping of trams. Alderman Cox urged that for the time being no further trams should be removed from service, and that all old trams should be reconditioned.

COMMUNICATIONS

Brazil.—TELEPHONE PROGRESS.—In its report for 1938 the Brazilian Traction, Light & Power Co., Ltd., which through affiliated concerns controls most of the telephone system in Brazil, states that the total number of telephones in service increased from 182,840 to 195,367 and the average number of daily calls from 3,025,194 to 3,356,967. As regards the technical developments during last year it is stated that extensions of two of the exchanges in Rio de Janeiro are now in progress and that in the State of Minas Geraes the work of extending and remodelling the exchange in the town of Bello Horizonte was completed and work commenced on the installation of an 8,000-line unit to replace the present 5,000-line unit. The exchanges in the towns of Cataguazes and San Thomas were modernised and a new exchange constructed at Pedro Leopoldo. In the State of San Paulo the extension of the exchange building at Campinas was completed and the capacity of the automatic equipment brought up to 2,400 lines by the installation of an additional 400 lines. In Jahu 200 additional lines were installed, increasing the capacity of the automatic equipment to 600 lines. At Cruzeiro the local outside plant was entirely rehabilitated and the old equipment replaced by a new 200-line switchboard.

The number of automatic telephones in service on the company's system at the end of the year was 135,228, an increase of 22,744 over 1937. During the year the net increase in toll line extensions placed in service totalled 2,249 miles, underground conduit constructed 113 miles, underground cable laid 69 miles and overhead line erected 64 miles. The international radio telephone service was by agreement with the local authorities made available to seven additional municipalities in the State of San Paulo.

Holland.—WIRELESS COMMUNICATIONS DISTURBED.—A *Reuter* message from the Hague states that in consequence of the European war the Argentine and Japanese Governments have asked the Netherlands Government to open direct wireless communication with South America and Japan, and favourable replies have been made in both instances. Difficulties affecting British wireless connections are given as the reason. The Netherlands Government has asked the United States to co-operate in the establishment of a direct wireless connection in place of the route *via* Great Britain.

Australian News

From a Perth Correspondent

OWING to the state of affairs in Europe at the time of writing (August 25th), business throughout the Commonwealth is very unsteady. Importers are concerned regarding future supplies, but opinion is general that Britain's firm stand must be backed by the Dominions. Steps have already been taken to safeguard essential services.

Sir Ernest Fisk, speaking at a recent dinner of the Electrical and Radio Development Association of New South Wales, declared that the Association would not be satisfied until electricity was available to the remotest settler in the State at a halfpenny a kWh. He added that the power of the future was electricity, and it was also mentioned that electricity was the only commodity in the world to-day which was selling for less than the ruling price in 1914.

The New South Wales Government is working on plans which will make electricity available in all parts of the State, so that rural districts will be given the comforts and conveniences which at present make urban life so much more attractive. The object of the plan is to keep men on the land, halting the reverse process so much in evidence to-day—the rural man going into urban areas to escape from the inconveniences of the country.

The recent appointment of Mr. Roger Vine Hall, chief engineer of the Sydney County Council, which controls the bulk of Sydney's electricity supply, as general manager at a salary of £3,000 per annum (his new duties commence on October 7th) is one of the romances of this vast undertaking. Mr. Vine Hall has been in the Council's service for 35 years; actually he was the first person to be appointed to the staff when the City Council started an electricity undertaking, and he thus now assumes command of a £20,000,000 undertaking of which he was a "foundation member." It is expected that he will retire in 1943, and that an opportunity will then be given to the present assistant general manager (Mr. Nolan) to take over the position which many people believed he would secure at this juncture. Applications for the position were received from all over the British Empire, and Mr. Vine Hall has been warmly congratulated upon his success. It is expected that the position of chief engineer, which Mr. Vine Hall will vacate when he assumes the general managership, will be filled from within the service.

The Sydney County Council has approved a recommendation by its general manager that materials should be purchased to the value of £48,871, as during a war in Europe they might not be procurable and essential services might be hindered. The report stated that it was proposed to store the materials as a reserve stock, the quantities of the materials being computed on a basis of estimated requirements for twelve months. Major items in the list submitted included gas-filled lamps (£17,060), mercury electric-discharge lamps (£8,875), spare parts for servicing ranges and other domestics heating appliances (£3,645), insulating oil (£4,670) and spare parts for the plant at the power stations (£3,800).

An extraordinary general meeting of the Adelaide Electric Supply Co., Ltd., recently approved a proposal that the capital of the company should be increased from £3,375,000 to £3,625,000 by the creation of 250,000 shares of £1 each, to be called D cumulative preference shares. These shares will be offered at par to the holders of the capital stock.

Lack of co-operation on the part of local governing bodies in the south-west of Western Australia in regard to the effort being made to establish a national power scheme at Collie is deplored by the Collie National Power Scheme Committee in a circular which has been issued to south-west local authorities. It is pointed out that promises made at a conference last January, when a large number of local governing bodies resolved to support the scheme, have not been put into effect. The circular states that "unless something is done of a concrete nature immediately at every centre, the Commission will be forced to come to a finding without all the evidence before it that it should have," and that "an adverse finding by the present Commission would result in this essential avenue of development being postponed for many years, to the very definite detriment of our portion of the State."

FINANCIAL SECTION

New Companies. Returns of Capital. Debenture Charges. Bankruptcies and Liquidations. Reports of Electrical Companies. Dividend Announcements. Stocks and Shares

New Companies Registered

Rothwell's Refrigerator Service, Ltd.—Private company. Registered September 2nd. Capital, £1,000. Objects: To carry on the business of refrigerating, electric light and power engineers and contractors, radio engineers, &c. Directors: H. Rothwell (permanent governing director), and Mrs. E. Rothwell, both of 451, Manchester Road, Baxenden, Accrington. Registered office: Willows Lane Works, Brunswick Terrace, Accrington.

William J. Smith.—Private company. registered September 2nd. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, gas, steam and hot water fitters, &c. Directors: W. J. Smith, Addington, 1, South Farm Road, Broadwater Green, Worthing; W. H. Smith, 39, Queenswood Avenue, Thornton Heath, Surrey, and J. W. F. Smith, 96, Greyhound Lane, S.W.16. 33a, Addington Square, Camberwell, S.E.5.

Allenby & Stokell (Manchester), Ltd.—Private company. Registered September 4th. Capital, £100. Objects: To carry on the business of electricians, electrical, mechanical, civil and constructional engineers, &c. Permanent directors: G. W. Allenby, 20, Farnville Avenue, Leeds, 8, and H. Huntingdon, 85, Upper Brook Street, Manchester, 13. Registered office: 85, Upper Brook Street, Manchester, 13.

Shernal, Ltd.—Private company. Registered September 2nd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in electric, gas and oil lamps, quartz lamps, reflectors, bells, fires, stoves, &c. Directors: A. W. Stapleton, 186, The Avenue, Highams Park, E.4, and R. H. Hatfield, 42, Balliol Avenue, Chingford. Secretary: A. W. Stapleton.

A. H. Cornwall & Sons, Ltd.—Private company. Registered September 5th. Capital, £1,000. Objects: To carry on the business of electricians, electrical and mechanical engineers and manufacturers, metal merchants, ironmasters and founders, &c. Directors: F. Angell (chairman), 5, Victoria Street, S.W.1, and A. H. Cornwall, 12, Queens Gardens, Heston, Hounslow. Registered office: 5, Victoria Street, S.W.1.

Tyley-Young, Ltd.—Private company. Registered September 8th. Capital, £500. Objects: To carry on the business of electrical engineers, electricians, mechanical engineers, manufacturers and workers of electricity, &c. Permanent directors: J. H. Tyley, 305, Edgeley Road, Cheadle Heath, Cheshire, A. Young, 48, Furnival Road, Gorton, Manchester, and C. H. Fenton, 14, St. Philip's Row, Gorton, Manchester. Registered office: 94, Market Street, Manchester.

Geo. W. Glascock & Co., Ltd.—Private company. Registered September 8th. Capital, £100. Objects: To carry on the business of general, electrical and radio engineers, television experts, &c. Geo. W. Glascock, 17, London Road, Redhill, Surrey, is the first director. Registered office: 17, London Road, Redhill, Surrey.

Companies' Returns

Statements of Capital

Murphy Radio, Ltd.—Capital, £150,000 in 144,000 ordinary shares of £1 and 120,000 "A" ordinary shares of 1s. Return dated April 13th. 98,838 ordinary and 68,264 "A" ordinary shares taken up. £42,736 11s. paid, £59,514 13s. considered as paid. Mortgages and charges nil.

Woodstock Power Syndicate, Ltd.—Capital, £10,000 in £1 shares. Return dated June 28th. 3,510 shares taken up. £3,510 paid. Mortgages and charges, £2,300.

Advance Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated July 5th. All shares taken up. £1,000 paid. Mortgages and charges nil.

Frinton-on-Sea & District Electric Light & Power Co., Ltd. — Capital, £100,000 in £1 shares. Return dated July 10th. 80,000 shares taken up. £80,000 paid. Mortgages and charges nil.

Settle and District Electricity Co., Ltd.—Capital, £100,000 in £1 shares. Return dated May 22nd. 75,000 shares taken up. £75,000 paid. Mortgages and charges nil.

West African Telegraph Co., Ltd.—Capital, £400,000 in 40,000 shares of £10. Return dated May 23rd. 23,109 shares taken up. £231,090 paid. Mortgages and charges nil.

Austin Brothers Electrical Co., Ltd.—Capital, £1,000 in £1 shares (700 ordinary and 300 preference). Return dated June 28th. All shares taken up. £700 paid. £300 considered as paid. Mortgages and charges nil.

National Electric Construction Co., Ltd.—Capital, £185,000 in 10s. shares. Return dated June 23rd. All shares taken up. £175,574 10s. paid on 351,149. £9,425 10s. considered as paid on 18,851. Mortgages and charges, nil.

Yale Electric Power Co., Ltd.—Capital, £20,000 in 3,300 preference and 16,700 ordinary shares of £1. Return dated July 7th. 1,000 preference and 16,700 ordinary shares taken up. £16,000 paid on 1,000 preference and 15,000 ordinary shares. £1,700 considered as paid on 1.700 ordinary shares. Mortgages and charges, nil.

Mortgages and Charges

Bill Switchgear, Ltd.—Satisfaction to the extent of (a) £500 on April 29th, 1938; (b) £500 on April 17th, 1939, and (c) £1,000 on August 4th, 1939, of charge dated January 25th, 1937, and registered August 10th, 1939. (According to the register of mortgages, the mortgage registered August 10th, 1939, pursuant to Order of Court originally secured £10,000.)

Pearl Industries, Ltd. — Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated August 26th, 1939, to secure all monies now or at any time owing by the company to the chargees (Trade Distributors, Ltd., of Equitable House, South Parade, Nottingham). Satisfaction to the extent of £10,500 on August 28th, 1939, of mortgage debenture registered March 24th, 1939.

Instanta Electric, Ltd.—Issue on August 4th, 1939, of £100 debentures, part of a series already registered.

Peto Scott Electrical Instruments (Holdings), Ltd.—Issue on August 25th, 1939, of £500 debentures, part of a series already registered.

A. E. Morrison & Sons, Ltd.—Mortgage on freehold lands and buildings in Great Wigston and Leicester, dated August 18th, 1939, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Automatic Internal Telephones, Ltd.—Satisfaction to the extent of £2,500, on August 9th, 1939, of debentures authorised April 17th, 1935, and registered May 24th, 1935.

Increases of Capital

E. H. Scott Radio Laboratories, Ltd.—The nominal capital has been increased by the addition of £1,500 beyond the registered capital of £15,000. The additional capital is divided into 6,000 unclassified shares of 5s.

Service Electric Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £2,500.

Northern Aluminium Co., Ltd.—The nominal capital has been increased by the addition of £400,000 in £1 ordinary shares beyond the registered capital of £1,100,000. At April 13th, 1939, Aluminium, Ltd., of Toronto, held 1,079,993 shares out of 1,080,000 issued. They were also allotted a further 420,000 shares for cash between April 27th and August 23rd, 1939.

Receiver Appointed

Silvagrey Electric, Ltd.—Robert W. Cox, C.A., of 12, Low Pavement, Nottingham, was appointed receiver on August 24th, 1939, under powers contained in instrument dated March 9th, 1938.

Company Liquidation

Northern Electrical Distributors, Ltd.—Meeting October 3rd at 56, Mosley Street, Manchester, to receive an account of the winding-up by the liquidator, Mr. H. Astles.

Bankruptcy Proceedings

J. Gibbons, radio dealer, 176, Abbey Street, Derby—Public examination October 24th at the Court House, 20, St. Peter's Churchyard, Derby.

C. Richmond, electrical and radio engineer, 7, Royd Crescent, Clay Pitts Lane, Halifax, formerly carrying on business at 73, Hanson Lane, Halifax, as C. Richmond and Son.—First and final dividend of 9d. in the £, payable September 12th, at 71, Manningham Lane, Bradford.

L. W. Russell (Russell's Radio Service), radio and electrical engineer, 142, Gravelly Hill North, Erdington, Birmingham.—First and final dividend of 2s. 2¾d. in the £, payable September 15th, at 37, Temple Street, Birmingham .

Private Arrangement

C. Smith & Sons, Main Street and High Street, Mexborough, and at Wath and Doncaster, radio dealers, &c. A conference of the creditors was held recently at Doncaster, when a statement of affairs was submitted showing gross liabilities of £3,019. The total assets were £1,046, leaving a deficiency of £1,973. An offer was submitted of a composition of 1s. in the £, but after some discussion it was decided that Mr. F. E. Bendall, of Poppleton & Appleby, 1, George Street, Sheffield, should investigate the position and report to the general body of creditors. A committee of four of the creditors was also appointed.

Reports and Dividends

Walsall Conduits, Ltd., is maintaining its interim dividend at 20 per cent., less tax.

The British Columbia Power Corporation has announced a quarterly dividend of 50 cents per "A" share (same).

A. Reyrolle & Co., Ltd., have announced an interim dividend of 5 per cent., less tax (same).

Vickers, Ltd., are maintaining the interim dividend on ordinary stock at 4 per cent.

Hoover, Ltd., are reducing their interim dividend from 3d. to 2d. per 5s. ordinary unit (from 5 per cent. to 3⅓ per cent.). The directors state that the results to date would have amply warranted a declaration of the same ordinary interim as last year. They feel, however, in view of the present emergency, that it would be wiser, in order to conserve resources, to reduce the dividend.

The Scottish Power Co. has declared an interim ordinary dividend of 2½ per cent. less tax (unchanged).

The Automatic Telephone & Electric Co., Ltd., is maintaining its interim dividend at 3 per cent., less tax.

British Insulated Cables, Ltd., has declared an interim ordinary dividend of 5 per cent., less tax.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK EXCHANGE markets are functioning in a sluggish and languid manner, but it is possible to deal in a good many stocks and shares though at tolerably wide prices. As soon as the Supplementary Budget is announced, it will become more possible than at present to calculate the likely effect, upon industrial and other companies, of the fresh taxation that is known to be imminent. Until then, business is bound to proceed very cautiously.

The Stock Exchange closes at 2 instead of 4 p.m., this bringing it into line with the present closing hour of the banks. In the course of the next two or three weeks conditions will have settled down into a more normal state. For the moment, business can be transacted only under conditions which make for delay. A lengthy list of falls in the market for home electricity supply shares is due to the fear that the companies can hardly hope to escape the unfavourable effects of lighting restrictions and rising costs.

Electricity Supply

The official order which came out the other day limiting to private customers their electricity and coal supplies to 75 per cent. of the normal, should not cause any qualms in the minds of holders of electricity supply shares. For one thing, the domestic part of a company's service is, as a rule, the least profitable, except, of course, in those cases where a company draws the greater part of its income from such revenue. In the majority of cases, however, the electricity supply companies find their principal source of profit lies in the supply of energy for power, and with factories, etc., working in the industrial districts at full pressure, the demands made upon power supply are likely to compensate very well for whatever diminution there may be in the domestic users' bills.

The daily black-outs do reduce, naturally, the amount of electricity used, but the commercial demand is already very heavy and is more likely to increase than to diminish. Most of the leading electricity supply companies have, to use a homely phrase, a little bit up their sleeves which will come in usefully, if required, for dividend equalisation purposes. In spite of these considerations, a feeling of uncertainty as to the probable profits of the supply companies has laid a heavy hand upon quotations for the ordinary shares.

Ever Ready Rise

Discrimination is already beginning to manifest itself in the matter of investment in stocks and shares. Substantial rises in what are called dollar stocks follow automatically the drop in the value of sterling as compared with the dollar. In the Home markets, the chief demand is centred upon shipping shares, where material rises have occurred in prices. Amongst the industrial groups, Ever Ready shares came into prominence by reason of the rush there has been for batteries and other accessories which the Ever Ready Company makes. The lowest price touched by the shares this year was 17s. 3d., and just before the outbreak of war the price had been keeping fairly close to this level. The demand of the past few days, however, has brought about a rise to 22s. 6d., and buyers have not found it an easy matter to obtain the stock that they wanted. Last year, Ever Ready shares rose to 26s. 6d. The company paid 30 per cent. dividend last year on its 5s. shares, which gives a yield at 23s. of 6½ per cent. on the money.

With matters so uncertain as they are it is, of course, impossible to do more than vaguely estimate what dividend performance any company is likely to achieve in respect of the present twelve months. Holders of Ever Ready shares are not likely to part from them, however, in view of the pressure there has been to buy the company's goods.

Telephone Expansion

Applying the principle of discrimination a little further, it is reasonable to anticipate that makers of electrical and telephone equipment stand to derive a good deal of benefit from war orders. Any firm connected with telephone equipment has, presumably, a full order book. The tremendous expansion which has taken place, even during the past fortnight, in the supply of telephones to air warden posts and other temporary stations, is in itself a bull point, so to speak, for the industry. Moreover, for some time past the cable companies have been fully employed in the work of duplicating, in some cases triplicating, public and private mains.

If the experience of the last war, 1914-1918, is anything to go by, cable companies should do well during the period of hostilities. Most of them came out of the Great War financially better than they went into it. Having regard to the development of telephony, and of cable work generally, during the past 25 years, it is a fair assumption that companies dealing with this branch of industry can be expected to increase their profits, though to what extent an increase of taxation will counterbalance such earnings, has yet to be disclosed.

Negotiation

People wanting just now to buy or sell stock are generally told by their brokers that the price is nominally so-and-so, dealing being a matter for negotiation. In ordinary times, dealers in the market will readily buy or sell stock in accordance with a member of the public's order to his broker, feeling reasonably assured that the flow of orders will keep the dealer's book shipshape. That is to say, buying and selling orders can be expected to come to the market something after the manner of an alternating current, thus obviating accumulation of an unwieldy balance either on one side or the other. Herein lies the essence of a free market. In times of very slow business, on the other hand, the jobber who buys can feel no assurance that a seller will shortly appear to relieve him of the stock, which might remain indefinitely in his books; while anything could happen in the interim to the price of the shares. Thus it is that an order to sell in these days must generally await execution until the market knows of another to buy, and vice versa. Hence the phrase, now familiar, of "a matter for negotiation," and the restriction of the freedom of dealings, which is, of course, further tightened by the rule that dealing must be only for cash.

Possibilities and Prices

It may be of service to point out, both to prospective buyer and to prospective seller, that no harm can be done in notifying their brokers of the price at which they wish to deal should that particular price be reached. Because a quotation is called, say, £3, this need not preclude a man who thinks that the shares would be cheap at 55s. from letting his Stock Exchange broker know what he would like to do if the price should go down. On the other hand, the seller who thinks that because a price is £3 it is therefore mere waste of time to leave an order to sell at 62s. 6d., can be assured that circumstances might arise in a market that would enable him to sell his shares at 3¼ whatever the nominal price happened to be.

This is not to say, of course, that clients need leave their brokers strings of orders at prices that are well removed from the current nominal quotations. It is meant as a hint that because a nominal price does not happen to fit in with the wishes of would-be buyer or seller, this should not stop anyone from giving his broker a limit, in either direction which, under unexpected conditions, might become practicable.

The Supplementary

It must be remembered, in connection with the possible profits of any industrial companies, that these profits are likely to be severely affected by the Supplementary Budget, of whose early introduction Sir John Simon spoke last week. Up to the present, those who have been following the market in industrial shares seem to have been inclined to ignore the possibilities which such Supplementary Budget presupposes. On the other hand, some of the more cautious followers of industrial ordinary shares have announced their intention of waiting until they know what the Chancellor will propose before they spend their money in stocks and shares.

Foreign Electricity Stocks

Brokers and banks are busy filling in forms, on behalf of their clients, for the registration of certain specified holdings of foreign securities at the Bank of England. Holders have until the 25th of this month to forward the necessary particulars, these evidently being required as the first step towards the mobilisation, if necessary, of foreign currency for the purchase abroad of essential materials. Market dealers have drawn up a list of the issues which appear in the official and supplementary Stock Exchange price lists and which are considered to come within the scope of the order. In the sections connected in one way or another with electricity appear the big trans-Atlantic communication companies, such as American "Tel. & Tel.," Western Union, and Canadian Marconi; the Canadian light and power undertakings, including those of Montreal, Quebec, and Shawinigan; and miscellaneous issues such as Brazilian Traction shares, Rio 5 per cent. bonds, Tokyo Electric 6 per cent. bonds, Great Northern Telegraph shares, and other issues on which the interest, dividends, or principal may be paid in any of the principal foreign currencies.

"House" Regulations

Temporary measures passed by the Stock Exchange Committee for regulating business in these early war days are few and clear cut. Minimum prices for gilt-edged securities remain at the line drawn last week. No dealings below these prices may take place between members or non-members. In this category are included the stocks of the Central Electricity and London Transport Boards, which are shown in our lists at the minimum figures. Both the prices and the list of securities affected may be varied at the Committee's discretion. A second regulation of chief importance is the order that all bargains must be for cash—in other words, the usual practice of paying for a delivery of stock at a fortnightly settlement is shelved for the time being. Thursday in last week would normally have been such a settlement day, but a fortnight's grace has been given. Finally, no new "time bargains" or options may be transacted.

Accident in A.R.P. Trench

COMMENT on the use of mains voltage in A.R.P. trenches was made by the Coventry Coroner (Mr. C. W. Iliffe) at an inquest on an employee of Messrs. A. C. Wickman, who received a fatal shock while installing some temporary electric lamps for the benefit of carpenters working in the trenches. The Coroner, recording a verdict of "Accidental death," expressed the hope that other people equipping trenches with electric light would realise that lower voltages were necessary.

ELECTRICAL COMPANIES' SHARES

Prices, Dividends and Yields

Company	1939 High-est	1939 Low-est	Dividend Pre-vious	Dividend Last	Price Sept. 12	Rise or Fall	Yield £	Yield s.	Yield d.
Home Electricity Companies									
Bournemouth and Poole	68/3	60/–	15	15	58/9	–⅓	5	2	0
British Power and Light	30/9	25/–	7	7	24/6	–1/–	5	9	10
City of London	33/9	29/6	7½	7½	8/–	–1/6	5	7	2
Clyde Valley	37/9	34/–	8	8	32/6	–½	4	18	6
County of London	46/9	39/–	10½	10½	32/6	–7/6	6	9	2
Edmundson's :									
7% Pref.	31/6	30/–	7	7	29/6	—	4	15	0
Ord.	27/9	23/–	9	6	21/–	–2/6	5	14	3
Elec. Dis. Yorkshire	41/6	37/9	9	9	35/–	–3/9	5	2	10
Elec. Fin. and Securities	47/9	45/–	12½	12½	47/6	—	5	5	3
Elec. Supply Corporation	51/9	47/6	12	12	43/9	–3/3	5	10	1
Isle of Thanet	20/–	18/6	4	4	18/–	–6d.	4	9	0
Lancs Light and Power	34/6	29/–	7½	7½	28/9	–⅛	5	4	4
Llanelly Elec.	22/6	20/6	5½	5½	20/6	—	5	7	4
Lond. Assoc. Electric	30/–	23/9	7	7	23/3	–6d.	6	0	5
London Electric	34/3	31/–	7	7	30/–	–⅛	4	13	4
London Power Deb. Red.	106½	101½	5	5	100½	–1	4	19	3
Metropolitan	51/–	43/6	12	12	38/9	–½	6	3	9
Midland Counties	38/9	34/–	8	8	33/9	–⅛	4	14	10
Mid. Elec. Power	41/9	38/3	8	9	36/–	–3/6	5	9	0
Newcastle Elec.	28/9	26/6	7	7	25/–	–2/–	5	12	0
North Eastern Electric :									
Ordinary	32/3	28/6	7	7	26/6	–2/–	5	5	8
7% Pref.	32/6	30/–	7	7	30/–	–6d.	4	13	4
Northampton	48/–	45/–	10	10	42/6	–1/8	4	14	0
Notting Hill 6% Pref. (£10)		12½	6	6	12½	—	4	14	1
Northmet Power :									
Ordinary	46/6	41/–	10	10	37/6	–3/9	5	6	8
6% Pref.	29/–	24/6	6	6	23/9	–9d.	5	1	1
Richmond Elec.	29/–	26/3	7	7	26/3	—	5	6	10
Scottish Power	38/9	33/9	8	8	31/3	–⅛	5	2	5
Southern Areas	22/9	19/–	5	5	18/6	–6d.	5	8	3
South London	30/9	26/3	7	7	25/–	–⅛	5	12	0
West Devon	23/3	21/3	5	5	21/3	—	4	14	1
West Glos.	21/3	17/3	2	2½	16/3	–⅛	3	1	6
Yorkshire Elec.	38/6	34/9	8	8	32/–	—	5	0	0
Overseas Electricity Companies									
Atlas Elec.	4/3	2/–	Nil	Nil	2/–	—		—	
Calcutta Elec.	39/–	28/3	10*	10*	26/6	–2/–		—	
Cawnpore Elec.	34/6	28/3	10	10	28/3	—		—	
East African Power	26/3	22/–	7	7	22/–	—	6	16	4
Jerusalem Elec.	24/6	22/–	7	7	22/–	—	6	17	3
Kalgoorlie (10/–)	10/6	9/6	7½	7	10/–	—	7	0	0
Madras	31/–	21/3	8*	8*	21/3	—		—	
Montreal Power	35½	31	1½	1½	32½	–1½		—	
Palestine Elec. "A"	29/6	20/–	7½*	5*	20/–	—	5	0	0
Perak Hydro-electric	18/9	13/6	7	6	12/6	–⅛	9	12	0
Shawinigan Power	23½	20	85cts.	83cts.	22	—		—	
Tokyo Elec. 6%	61	37	6	6	39½	+2/–	15	4	0
Victoria Falls Power	73/9	60/–	12½	15	63/9	–⅛	4	14	4
Whitehall Investments Pref.	19/6	15/–	7½	7½	15/–	—	10	0	0
Public Boards									
Central Electricity :									
1950–70	112	103	5	5	103	—	4	17	1
1955–75	115½	107	5	5	107	—	4	13	6
1951–73	106½	101	4½	4½	101	—	4	9	0
1963–93	95½	84	3½	3½	84	—	4	3	4
London Elec. Trans. Gtd.	88½	83	2½	2½	83	—	2	19	6
London & Home Counties									
1955–75	107½	105	4½	4½	105½	—	4	5	6
Lond. Passenger Transport :									
A	114½	103	4½	4½	103	—	4	7	5
B	117½	102	5	5	102	—	4	18	0
C	83½	64½	4½	4	65	—	6	3	1
West Midland Joint Elec.,									
1948–68	112½	107	5	5	107	—	4	13	6
Telegraph and Telephone									
American Tel. & Tel.	182½	159	9	9	195	+12½	4	12	4
Anglo-Am. Tel.:									
Pref.	101½	89½	6	6	91½	–1	6	11	9
Def.	23¾	19	1½	1½	21	—	7	2	10
Anglo-Portuguese	24/–	19/9	8	8	20/–	–9d.	8	0	0
Cable & Wireless :									
5½% Pref.	95½	75	4½	5½	82½	–3	6	13	4
Ord.	55	34	4	4	47½	–2	8	8	8
Income	100	95½	—	—	94½	–2½	4	4	6
Canadian Marconi $1	5/6	3/9	—	Nil	5/6	+⅛		—	
Globe Tel. & Tel. :									
Ord.	31/3	23/6	7½*	7½*	28/9	–⅛	5	4	4
Pref.	26/9	23/3	6	6	23/9	—	5	1	1
Great Northern Tel. (£10)	38	27½	20	20	28	—	7	7	10
Inter. Tel. & Tel.	10½	6½	Nil	Nil	5½	–2		—	
Marconi-Marine	30/–	23/–	7½	10	27/6	—	7	5	6
Oriental Telephone Ord.	2½	46/3	12*	12*	2⅞	—	4	16	0
Radio Corpn.	8½	5½	8	6	6	+½		—	
Telephone Props.	14/–	12/9	5	6	13/9	—	8	14	6
Telephone Rentals (5/–)	10/–	8/6	10	10	8/–	–6d.	6	5	0
Western Union	28	19½	2½	—	27½	+4		—	
Traction and Transport									
Anglo-Arg. Trams :									
First Pref. (£5)	7/6	3/6	Nil	Nil	3/9	—		—	
4% Inc.	16	7	Nil	Nil	7½	—		—	
British Electric Traction :									
Def. Ord.	1025	700	5	5	725	–125		—	
Pref. Ord.	164	150	8	8	150	—	5	3	3
Bristol Trams	52/6	37/3	8	10	44/–	–5/6	4	11	0
Brazil Traction	13	7½	$1	50c.	7½	–¾		—	
Calcutta Trams	25/6	22/–	8	8	23/6	–6d.	6	16	2
Cape Elec. Trams	18/–	16/9	5	6	17/6	—	6	17	2
Lancs Transport	37/9	32/6	10	10	32/6	–3/6	6	3	1
Mexican Light :									
1st Bonds	25	20	5	5	20	—		—	
Rio 5% Bonds	81	47	5	5	65	—	7	9	3
Southern Rly :									
5% Prefd.	75½	48	5	5	53	–5	9	8	8
5% Pref.	99½	79	5	5	80	—	6	5	0
T. Tilling	2½	39/6	10	10	38/9	–6/3	5	3	1
Tilling & B.A.	54/6	50/–	10	9*	53/9	—	3	7	0
West Riding	37/9	31/3	10	10	35/–	—		—	
Equipment and Manufacturing									
Aron Electricity Ord.	32/3	28/9	15	15	30/–	—	10	0	0
Assoc. Elec. :									
Ord.	45/3	34/9	10	10	38/6	–6d.	5	4	0
Pref.	36/6	34/–	8	8	35/–	—	4	11	5
Automatic Telephone & El.	47/6	39/3	10	12½	43/9	—	5	14	3
Babcock & Wilcox	48/–	37/–	10	12½	45/9	—	5	9	3
British Aluminium Ord.	58/9	48/9	12½	12½	58/9	+½	4	4	0
British Insulated Ord.	88/–	77/–	20	20	80/–	–⅛	5	0	0
British Thermostat (5/–)	16/–	12/–	18½	18½	13/9	—	6	14	7
British Vacuum Cleaner (5/–)	22/6	14/–	40	40	15/–	—		—	
Brush Ord.	5/9	4/6	Nil	Nil	4/9	–3d.		—	
Callender's	92/–	60/–	20	15	61/3	–⅛	4	16	0
Chloride Elec. Storage	82/3	62/6	20	15	3½	–⅛	4	12	4
Consolidated Signal	96/–	80/9	36½	36½	82/6	—	8	16	9
Crabtree (10/–)	25/6	21/6	17½	17½	22/6	—	7	15	4
Crompton Parkinson :									
Ord. (5/–)	21/–	14/9	12½	15	17/6	—		—	
E. K. Cole (5/–)	9/–	4/–	10	Nil	4/–	–6d.		—	
Elec. & Musical Industries (10/–)	14/9	8/9	10	5	7/3	–2/3	6	18	0
Electric Construction	38/6	30/6	12½	13½	35/–	—	7	14	3
Enfield Cable Ord.	58/6	48/6	25	16½	50/–	—	6	10	0
Electrical Switchgear (10/–)	27/–	23/9	16	16	23/9	—	6	14	9
English Electric	36/6	30/3	10	10	32/–	–½	6	5	0
Ensign Lamps (5/–)	16/9	13/9	—	25	15/9	—	7	18	3
Ericsson Tel. (5/–)	43/–	35/–	25*	25*	41/3	—	3	0	8
Ever Ready (5/–)	24/–	18/–	35	30	22/6	+4/–	6	13	4
Falk Stadelmann	27/–	18/9	10	6	18/9	—	6	8	0
Ferranti Pref.	25/6	22/6	7	7	23/–	—	6	1	9
G.E.C. :									
Pref.	31/9	29/3	6½	6½	31/3	—	4	3	2
Ord.	82/–	70/9	17½	20	73/6	–1/6	5	8	8
Greenwood & Batley	27/6	24/6	7	15	26/3	—	11	9	0
Hall Telephone (10/–)	22/3	19/3	15	15	20/–	—	7	10	0
Henley's (5/–)	21/–	17/3	20	20	17/6	—	5	14	3
4½% Pref.	23/–	21/–	4½	4½	21/3	—	4	4	8
Hopkinsons	46/3	37/3	12½	15	43/9	—	6	17	7
India-Rubber Pref.	21/3	20/–	5½	5½	20/–	—	5	10	0
Intl. Combustion	120/–	97/–	32½	32½	5 1/6	—	5	14	5
J. Lucas	60/–	52/–	15	15	57/6	–⅛	5	4	2
Johnson & Phillips	41/3	32/–	12½	12½	38/9	—	6	8	10
Lancashire Dynamo	68/–	57/6	25	25	60/–	—	8	6	8
Laurence Scott (5/–)	12/–	10/–	15	15	10/–	–3d.	7	6	4
London Elec. Wire	31/6	28/6	12	7½	28/9	—	5	4	4
Mather & Platt	50/–	42/6	13½	13½	41/3	–1/8	6	11	3
Metropolitan Elec. Cable Pf.	21/3	21/–	5½	5½	21/3	—	5	3	6
Murex	85/9	63/9	20	20	77/6	—	5	3	1
Pye Deferred (5/–)	13/9	7/6	25	25	8/–	—	15	12	6
Revo (10/–)	35/6	26/–	17½	17½	26/3	—	6	13	7
Reyrolle	61/–	52/6	12½	12½	56/3	—	4	9	0
Siemens Ord.	26/9	20/6	7½	7½	21/3	—	7	1	2
Strand Elec. (5/–)	5/6	3/9	5	10	3/9	—	3	6	8
S. Smith (1/–)	9/	6/–	37½	50	7/6	—	6	13	4
Switchgear & Cowans (5/–)	15/–	11/3	20	20	12/–	—	8	6	8
Telegraph Condenser (10/–)	7/6	5/–	5	—	7/6	—		—	
Telegraph Construction	2½	37/6	10	10	38/9	—	5	3	1
Telephone Mfg. (5/–)	10/–	8/–	9	9	8/0	–6d.	5	12	6
Tube Investments	91/–	82/9	23¾	23¾	82/6	–¾	5	16	6
Vactric (5/–)	4/3	2/3	10	4	2/3	—	8	18	0
Vickers (10/–)	24/6	16/3	10	10	17/9	—	5	12	8
Ward & Goldstone (5/–)	22/6	19/6	20	20	19/9	—	5	1	3
Westinghouse Brake	54/9	43/9	17½	17½	45/–	–1/8	7	15	6
Walsall Conduits (4/–)	31/9	24/–	55	55	23/9	–9d.	9	5	2
West, Allen (5/–)	7/6	5/9	7½	10	5/9	—	8	14	0

* Dividends are paid free of Income Tax.

NEW PATENTS

Electrical Specifications Recently Published

Compiled by a firm of chartered patent agents. The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1936

34664. "Change-over switch mechanism for electric circuits." J. M. Beaumont. January 15th, 1938. (511276.)

1937

30786. "Rheostats or potentiometers." International Resistance Co. January 7th, 1937. (511178.)

31172. "Electrical measurement of changes in physical dimensions." British Thomson-Houston Co., Ltd. September 25th, 1937. (511277.)

34236. "Electrical communication systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. December 10th, 1937. (Cognate application 16233/38.) (511420.)

34291. "Device for the manufacture of pressed electrodes for arc welding." K. Lange and F. Lange. December 10th, 1936. (Cognate application 34292/37.) (511182.)

1938

402. "Electrodes for electric-discharge tubes." F. J. Cleveland (H. R. Berliner). January 6th, 1938. (511185.)

911. "Photo-electric systems for automatically controlling variable magnitudes." C. J. Tagliabue Mfg. Co. February 10th, 1937. (511280.)

998. "Relay-controlled electrical systems." J. Crawford, W. A. B. Ames and W. E. Lawley. January 12th, 1938. (511187.)

1234. "Telephone installations." Telefonbau und Normalzeit Ges. January 14th, 1937. (511189.)

1362. "Electric motor-control systems." Westinghouse Electric and Manufacturing Co. January 16th, 1937. (511354.)

1665. "Lighting appliances, particularly for operating theatres and the like." Igranic Electric Co., Ltd., K. R. Mackley (legal representative of A. H. Mackley, deceased), and G. A. Mower. January 18th, 1938. (511194.)

4467. "Electrical heating elements and articles for use at high temperatures." Heraeus-Vacuumschmelze Akt.-Ges. April 5th, 1937. (Addition to 408833.) (511494.)

4543. "Dynamo-electric machines." Scintilla, Ltd. February 12th, 1937. (511496.)

4569. "Thermostatic switches." British Thomson-Houston Co., Ltd. February 15th, 1937. (511355.)

4619. "Quick-break electric switches." V. Hope. February 15th, 1938. (511288.)

4702. "Sources of light comprising a high-pressure mercury vapour electric discharge and an incandescent filament in series with it." General Electric Co., Ltd. (Patent Treuhand-Ges. für Elektrische Glühlampen). February 15th, 1938. (511199.)

4703. "Means for illumination." General Electric Co., Ltd., and D. C. Espley. February 15th, 1938. (511200.)

4733. "Wire systems for distributing speech and music." Standard Telephones & Cables, Ltd., J. R. Vezey and A. L. Long. February 15th, 1938. (511294.)

4735. "Electric forging machines." G. D. M. Benedetto. February 15th, 1938. (511295.)

4783. "Apparatus for indicating the presence or intensity of charges of static electricity." C. R. A. Chadfield. February 16th, 1938. (511434.)

4792. "Electric signalling apparatus." W. C. Bailey. February 16th, 1938. (511359.)

4824. "Electron-discharge devices for use in television or like systems." Baird Television, Ltd., and V. A. Jones. February 16th. 1938. (511362.)

4825. "Television and like systems." Fernseh Akt. Ges. February 17th, 1937. (511363.)

4826. "Electric circuit-breakers having arc-control devices." A. Reyrolle & Co., Ltd., and A. Allan. February 16th, 1938. (Cognate application 805/39.) (511364.)

4874. "Electric meters for measuring high-frequency power." Siemens & Halske Akt.-Ges. March 24th, 1937. (Cognate application 4875/38.) (511367.)

4973. "Cathode-ray tubes." L. F. Broadway and O. Klemperer. February 17th, 1938. (511444.)

4983. "Electric cooking apparatus." R. H. Rogers. February 17th, 1938. (511445.)

4993. "Electric ships' drives." Brown, Boveri & Cie Akt.-Ges. February 17th, 1937. (511570.)

4995. "Device for producing large apparent electric powers and for testing apparatus therewith." Gemeente Amsterdam. February 17th, 1937. (511446.)

5005. "Electrical bonding couplings." Marconi's Wireless Telegraph Co., Ltd., and J. W. Sanger-Stevens. February 17th, 1938. (511448.)

5006. "Electron-discharge devices." Marconi's Wireless Telegraph Co., Ltd., and G. B. Banks. February 17th, 1938. (Cognate application 18481/38.) (511449.)

5063. "Tuning of radio receivers." E. K. Cole, Ltd., and A. W. Martin. February 18th, 1938. (511503.)

5106. "Earthing devices for use with electrical systems." London Electric Wire Co., & Smiths, Ltd., and J. Starling. February 18th, 1938. (511508.)

5109. "End fittings for electric cables having refractory insulation, and their attachment to the ends of such cables." Solution Trust, Ltd. February 18th, 1937. (Addition to 471536.) (Cognate application 5110/38.) (511509.)

5146. "Electric resistance furnaces." F. Essmann and W. Delmhorst. November 16th, 1937. (511515.)

5173. "Television receivers." Kolster-Brandes, Ltd., C. N. Smyth and R. J. Berry. February 18th, 1938. (511519.)

5181. "Electron microscopes." M. Von Ardenne. February 18th, 1937. (511204.)

5200. "Concentric trunk communication cables." Siemens & Halske Akt.-Ges. February 26th, 1937. (Addition to 492243.) (511524.)

5216. "Electric motor control systems." British Thomson-Houston Co., Ltd., H. C. Hastings and F. F. C. Usher. February 18th, 1938. (511205.)

5260. "Arrangement for the construction of high- or low-frequency amplifying apparatus." C. Lorenz Akt.-Ges. February 19th, 1937. (511579.)

5265. "Manufacture of electric condensers." British Insulated Cables, Ltd., F. J. Brislee, B. Welbourn, H. Higham and J. Quayle. February 19th, 1938. (511580.)

5368. "Tuning arrangement for wireless receivers." Telefunken Ges. für Drahtlose Telegraphie. February 20th, 1937. (Addition to 505896.) (511533.)

5398. "Interruptable power transmission connections." Allen West & Co., Ltd., and R. J. Benny. February 21st, 1938. (511452.)

5466. "Electrical switching apparatus with arc-suppressing arrangements." Micro Switch Corporation. February 20th, 1937. (511538.)

5467. "Snap mechanisms." Micro Switch Corporation. February 20th, 1937. (511539.)

5884. "Electron microscopes." M. Von Ardenne. February 24th, 1937. (Addition to 511204.) (511206.)

9375. "Miners' lamps." Ceag, Ltd., and R. J. Plummer. March 26th, 1938. (511551.)

9686. "Fused socket couplings and other fluid electrical accessories." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and B. G. Harrison. March 30th, 1938. (Cognate application 10280/39.) (511376.)

10809. "Insulating and dielectric materials." British Thomson-Houston Co., Ltd. April 10th, 1937. (511215.)

10986. "Electric fuses, cut-outs, connectors, links and the like." E. T. G. Donovan. April 11th, 1938. (Cognate application 5432/39). (511378.)

11038. "Thermionic cathodes." General Electric Co., Ltd., and M. Benjamin. April 11th, 1938. (511379.)

11521. "Electrically operated indicating device." Short & Mason, Ltd., and S. J. Wise. April 14th, 1938. (511380.)

12921. "Thermally actuated electrical cut-outs." H. W. Lindahl. May 1st, 1937. (511383.)

12956. "Means for tuning-in wireless receiving apparatus to given broadcasting stations." G. Soffietti and P. C. Ricchiardi. January 25th, 1938. (511309.)

13233. "Electrical systems of remote control." General Electric Co., Ltd., and J. Y. Fletcher. May 4th, 1938. (511311.)

13288. "Independently heated thermionic cathodes for electric-discharge devices." General Electric Co., Ltd., and H. T. Ramsay. May 4th, 1938. (511384.)

15094. "Tuning and indicating devices for radio and similar carrier-wave signal receiving apparatus." M-O Valve Co., Ltd., and H. S. Smith. May 20th, 1938. (511386.)

15731. "Electric switches of the slow-make, slow-break type." Igranic Electric Co., Ltd. May 26th, 1937. (Cognate application 15732/38.) (511387.)

16921. "Electric signalling systems." Standard Telephones & Cables, Ltd. June 18th, 1937. (511222.)

19873. "Electro-magnetic responsive devices for use in watt-hour meters, or other electro-magnetic measuring instruments of the induction type." Westinghouse Electric & Manufacturing Co. July 10th, 1937. (511225.)

20284. "Electron-discharge apparatus." Standard Telephones & Cables, Ltd. July 22nd, 1937. (511392.)

23408. "Gas- or vapour-filled electric-discharge devices." Patentverwertungs-Ges. Hermes. August 7th, 1937. (511397.)

27537. "Method of, and apparatus for, the elimination of high-frequency interference in superheterodyne receiving apparatus." R. T. Magyar Wolframlampa Gyar Kremenezky, Janos. September 21st, 1937. (511329.)

28495. "Electro-magnetic relays." Telefonaktiebolaget L. M. Ericsson. November 27th, 1937. (511563.)

30337. "Generator of oscillations for ultra-short waves." Ideal Werke Akt.-Ges. für Drahtlose Telephonie. October 29th, 1937. (511468.)

31104. "Indicating the disposition of magnetic fields." F. Unger and R. S. Hilpert. November 13th, 1937. (511336.)

32078. "Electric-cable fittings for carrying cables into electrical apparatus and through partition walls." Brookhirst Switchgear, Ltd., and A. C. Livesey. November 5th, 1938. (511404.)

33881. "Electric condensers." R. Bosch Ges. November 24th, 1937. (511251.)

36700. "Current and/or voltage valve indicating apparatus." Klangfilm Ges. December 31st, 1937. (511263.)

1939

862. "Metal-vapour electric-discharge devices." Patentwertungs Ges. Hermes. January 10th, 1938. (511405.)

1650. "Electric welding machines." British Thomson-Houston Co., Ltd. January 17th, 1938. (511477.)

2234. "Electric signalling systems." Wired Radio, Inc. March 3rd, 1938. (511345.)

7446. "Manipulating knobs for movable members of electrical apparatus, radio receivers, measuring appliances, and the like." Fabrica Italiana Magneti Marelli. March 10th, 1938. (511413.)

8710. "Adjustable electric condensers." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 21st, 1938. (511415.)

CONTRACT INFORMATION

Particulars of work for which tenders are invited, contracts placed, and building schemes promising work for electrical contractors and traders

Contracts Open

*Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses. Further details of items marked with an asterisk can be obtained from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.*1.

Argentina.—BUENOS AIRES. — October 2nd. Two pumping sets with switchboards, transformers, cable, &c. Argentine National Sanitation Department. (T.Y. 25937/39).*

Australia. — MELBOURNE.—September 26th. Posts and Telegraphs Department. Telephone transformers. (T. 26136/39.)*

BRISBANE.—October 11th. Electrically driven pumping unit comprising pump, motor, discharge column in well, shafting and control gear, &c. Department of Irrigation, Water Supply & Sewerage, Executive Buildings, George Street, Brisbane. (T. 26172/39.)*

PERTH.—November 2nd. Western Australia Government Tender Board. Supply and delivery of two 500-kW mercury arc rectifiers, switchgear, feeders, control system, &c. (T. 26439/39.)*

SYDNEY. — October 17th. Posts and Telegraphs Department. Lead sheathed cable. (T. 26613/39.)*

October 24th. Lamps, lamp caps and sockets. (T. 26617/39.)*

Canterbury.—September 23rd. Electrical installation for conversion of former hospital into technical institute, for E.C.; R. H. Stevens, director of education, 12, St. George's Place. Deposit: £1 1s.

Devonshire.—September 21st. Royal Devon and Exeter Hospital, Exeter. Supplies of electric lamps for twelve months from October 1st. Forms of application are obtainable from the secretary and manager.

Eccles.—September 18th. Education Committee. Installation of electric lighting, wiring, &c., open air schools, Peel Green. Borough electrical engineer, Electricity Offices, 1, King Street (deposit £1 1s.).

Egypt.—CAIRO.—September 30th. Four pumps for Kafr El Elw central power station. Tanzim Department, Ministry of Public Works. (T. 26146/39.)*

October 18th. Extension of the electrical network at Damietta. Municipalities Department. (T. 26152/39.)*

Exminster. — Friday, September 22nd. Committee of the Devon Mental Hospital. Electric lamps, for six months. Tenders to the clerk, Mr. C. Masters.

Glamorgan.—September 27th. Installation of electric light and power at the new Bridgend Senior Council School. D. J. Parry, Clerk to County Council, County Hall, Cardiff.

India.—NEW DELHI.—June 9th, 1940. Indian Stores Department Electrical Section. AC and DC table fans. (T. 35343/39.)*

Lincoln.—September 25th. North Lindsey Water Board. Electrically driven pumping plant for two pumping stations. (September 8th).

London.—Great Western Railway. September 21st. Various stores. (September 8th).

Manchester.—September 21st. Electricity Committee. Switchgear bus-bar protective equipment. (August 25th).

October 5th. Electricity Committee. One mercury arc rectifier equipment. (See this issue.)

Montrose. — September 23rd. Town Council. Electric lighting work at Rossie Island housing estate (44 houses). Tenders to Town Clerk.

New Zealand.—WELLINGTON.—November 14th. Supply of 50-kV, three-phase, outdoor switchgear and steelwork complete with insulators and accessories. (T. 26179/39.)*

Pembrokeshire.—September 29th. Renewal of fog-signalling machinery and installation of electric light generating plant at the South Bishop lighthouse off the Pembrokeshire coast. Secretary, Trinity House, Tower Hill, London, E.C.3.

Salford.—September 19th. Corporation. Rubber-insulated cables and electric lamps. (September 8th).

South Africa.—JOHANNESBURG.—November 17th. City Council. 33-kV switchgear and auxiliary plant. (T. 25663/39.)*

PRETORIA.—September 28th. Union Tender and Supplies Board. Low-voltage cable and end and joint boxes. (T. 26367/39.)*

Twelve private branch exchange switchboards, sixty mounting plates and twenty-four multiple jacks. (T. 26708/39.)*

WINDHOEK.—October 18th. Municipality. Two AC generators. (T. 26700/39.)*

Warrington. — September 18th. Electricity Department. Extra-high and low-voltage, paper- and lead-covered and other cables; earthenware conduits and concrete slabs, tiles and covers for twelve months. (September 1st.)

TRADE MARK APPLICATIONS

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from September 6th :—

Autogall. No. 606998. Class 1 (IV). Welding fluxes and chemical compositions for use in the manufacture and treatment of metals.—F. A. Hughes & Co., Ltd., Abbey House, Baker Street, N.W.1.

Ferrospeed. No. 606813. Class 6 (IV). Iron and steel in the form of strip, rod and wire for electric welding.—Ferro-Arc Welding Co., Ltd., Thames House, Millbank, Westminster, S.W.1.

Thermium. No. 607842. Class 11 (IV). Apparatus embodying hot or cold water tubes for heating or cooling air.—Thermo Electrical Engineering Co., Ltd., 46, Frederick Street, Birmingham.

Orders Placed

Bootle.—Watch Committee Recommended.—Lighting equipment for Marsh Lane, Irlam Road and Grove Street (£1,190); Wardle Engineering Co.

Hove.—Electricity Committee. Recommended. Two 400-kVA transformers (£374).—Transformers & Welders, Ltd. Nine-panel distribution board (£166) and one eight-way distribution board (£146). —Lucy & Co., Ltd. Switchgear (£268).—Switchgear & Cowans, Ltd. Motor-generator (£55).—English Electric Co., Ltd. Conversion of dental apparatus (£118).—Sussex Dental Supply Co., Ltd. Conversion of domestic motors and other apparatus (£401).—City Electrical Co.

Kerry.—Board of Health. Accepted. Installation of an X-ray apparatus at Tralee County Hospital (£893); Fitzgerald Bros.

London.—L.C.C. Accepted. Wiring and fittings for electric lighting and power, &c., in wards 30, 31 and 32, St. Mary Abbott's Hospital, Kensington :—

	£
Pemberton and Sturgess (Great Britain), Ltd. (Accepted)	**467**
Duncan Watson (Electrical Engineers), Ltd.	479
General Electrical Maintenance Co. ...	489
Samuel Reed & Sons	501
W. G. Perry & Co., Ltd.	516
T. Clarke & Co., Ltd.	528
F. Troy & Co., Ltd.	539
Springvale Electrical Co., Ltd.	543
Warren Smith & Co.	597
Page and Girling, Ltd.	682

Wiring and fittings, Princess May Road :—

	£
Commercial Light, Heat and Power Co. (Accepted)...	**881**
Newman and Watson, Ltd.	916
Jacob, White & Co., Ltd.	946
Electrical Installations, Ltd.	984
Troughton and Young, Ltd.	986
Samuel Reed & Sons	998
Holliday & Son (Electrical) Ltd.	998
Archibald Meckhonik	1,011
A. Dean & Co., Ltd.	1,024
General Electrical Maintenance Co. (G. A. Davenport, Ltd.)...	1,076
Warren, Smith & Co.	1,087

Wiring and fittings for electric lighting, heating and power at the school of photo-engraving and lithography :—

	£
C. J. Ferguson & Sons, Ltd. (Accepted)...	**444**
F. H. Wheeler & Co., Ltd.	481
Pinching and Walton	488
J. D. Henderson, Ltd.	505
J. E. Swann & Co., Ltd.	506
E. and C. Champion	548
Keeble, Ltd....	565
Archibald Meckhonik	615
A. H. Cornwall & Sons, Ltd.	640
W. G. Perry & Co., Ltd.	644
Berkeley Electrical Engineering Co., Ltd.	651

Peterborough. — Education Committee.—Accepted. Electrical installation at the Eastholme School (£392). M. F. Hansen.

Portsmouth. — Education Committee. Accepted. Electrical installations. Stamshaw school (£395).—G. W. Bentley, Ltd.; Milton school (£300).—Shields & Marshall.

Worcestershire. — County Council. — Accepted. Electrical installation at the nurses' home, Kidderminster (£655).—Abell & Smith's Electrical Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Factory, for Marshall & Co. (Aberdeen), Ltd.; Jenkins & Marr, architects, 3, Bon Accord Crescent.

Bamber Bridge.—R.C. school; P. A. Baines & Son (Preston), Ltd., contractors, Paley Road, Preston.

Barnsley.—Houses (6), Queens Drive; D. Haigh. Bungalows, Carlton estate; borough engineer.

Basford (NOTTS).—Houses, for the Calverton Housing Association, Woodborough, Nottingham.

Billingham-on-Tees.—Further houses on the St. Bede's Road estate; C. H. Webster, builder, Billingham.

Birkenhead.—Senior school; E. Kirby & Sons. Houses (11), Devonshire Place; W. I. Jones.

Birmingham.—Factory, for T. Norton & Co., Ltd.

Blackburn.—Extension of the public library for the T.C.; William Livesey & Sons, Ltd., contractors, Nova Scotia Works, Bolton Road, Blackburn.

Blackpool.—Shops and flats; Derham Mackieth & Partners, architects. Houses (16); R. Mitchell, Ltd. Houses (19); H. Eckersley. Houses (15), Bangor Avenue; R. Fielding & Sons.

Bristol.—Factory; A. T. Pocton & Sons.

Chester-le-Street.—Cinema, for Jos. H. Mole, Burn Grove.

Chorley.—Houses, for Town Council; borough surveyor.

Cleckheaton.—Houses, for the Spenborough U.D.C.; Haywood & Peirson, contractors, 28, Bennett Street, Dewsbury.

Coventry.—Development of estate; Exhall Estates, Ltd. (W. Wilson, director).

Cramlington.—Hotel, for R. Deuchar, Ltd.; J. and W. Lowry, builders, Corporation Street, Newcastle-on-Tyne.

Darlington.—Remodelling of the King's Head Inn for R. Fenwick & Co.; Gordon Durham & Co., builders, East Boldon, Co. Durham. Houses; R. S. Dawson and Co., builders, Darlington. Houses (28); Bussey and Armstrong, builders, Brinkburn Road, Darlington.

Dartford.—Factory, Abwood Tool Co., Abbey Wood.

Devon.—Alterations, &c., to Institutions at Newton Abbot, Tavistock and Totnes, for P.A.C.; county architect, Heavitree Road, Exeter.

Didcot.—Laundry, for Oxford and District Co-operative Society, Ltd.; secretary.

Docking.—Church central school; Carnell and White, architects, Paradise Chambers, King's Lynn.

Durham.—Gymnasium, St. Hilda's College; D. Glen, builder, Back Queen's Road, Jarrow.

Edinburgh. — Preparatory school, Daniel Stewart's College, Queensferry Road; principal.

Eston.—Institute; South Bank Baptist trustees.

Felling-on-Tyne. — Shopping centre, Nest House estate; U.D.C. surveyor.

Fifeshire.—Houses at Comrie; Scottish Special Housing Association, Ltd., Edinburgh. Police station, St. Andrews, for C.C.; county clerk, Cupar, Fife.

Grimsby.—Factory; Clark & Co.

Heysham.—Methodist Church; Richard Dobson, architect, 32, Northumberland Street, Morecambe.

Huddersfield.—Senior school, Deighton; Samuel Procter, town clerk, Town Hall.

Kent.—Dispensary, Dartford, extensions to Institution, Farnborough, and convalescent block, Lenham Sanatorium; county architect, Sessions House, Maidstone.

Kingsteignton.—Houses (36), Clifford Avenue; C. Patchett.

Knutsford (CHESHIRE).—School for the Chester Diocesan Church Schools Association; Arthur Fenton, Ltd., contractors, James Street, Miles Platting, Manchester.

Lleyn (CAERNARVONSHIRE).—Houses; Jones & Owen, Brongadair, Mynytho, near Llanbedrog.

London. — (STEPNEY).—Extensions to factory, B. J. Friend & Co.; E. A. Remnant, architect, 10, Grays Inn Square, W.C.1.

Macclesfield.—Selective central school, Beech Road; education architect.

Manchester.—Premises at Northenden, for Manchester & Salford Equitable Co-operative Society. Extensions to factory; British Driver Harris Co., Ltd.

Mansfield.—Factory, J. O. Frame, Ltd.; H. Rouse & Sons, contractors, 30, High Street, Mansfield Woodhouse.

Middlesbrough.—Extensions to premises, for the Middlesbrough and District Motor Club; N. Thompson, Ltd., builders, Stonehouse Street, Middlesbrough. Extensions to works, R. W. Rundle & Co.

Motherwell.—Alterations for Dalziel Co-operative Society, Ltd.; the manager. Temporary school buildings at Wishaw; county architect, County Council, Hamilton.

Nantwich.—Erection of additional wards at Isolation Hospital, for the Nantwich Joint Hospital Board (A. R. Whittingham, clerk 14, Barker Street); contractors, Pugh Bros., Pepper Street, Middlewich, Cheshire.

Newcastle (STAFFORDSHIRE).—Store premises, Thistleberry Avenue, for Silverdale Equitable Industrial Co-operative Society, Ltd.; Hollins & Jones, architects, Lloyds Bank Chambers.

Newcastle-on-Tyne.—Rebuilding premises in New Bridge Street, for the National Deposit Friendly Society; H. Kindred, builder, 145, West Road, Newcastle. Block of shops and offices in Northumberland Street, for Montague Burton, Ltd.; Robert Hudson and Sons, builders, St. Mark's Crescent, Sunderland.

Norham and Islandshires.—Houses (40); R.D.C. surveyor, Berwick-on-Tweed.

Oxford.—Houses: Wilkins, Arnett and Knight. Houses (12); Cripps and Stewart.

Peterborough. — Block of offices; Thomas Measures & Son, builders, Dickens Street, Peterborough.

Plymouth.—Reconstruction of Kingsbridge Inn, Swilly and London Mail Inn, Efford; Plymouth Breweries, Ltd.

Portsmouth.—Church hall; Ellis & Son, Ltd. Houses (20), Cosham; H. J. Clifton.

Preston.—Rebuilding works, for N. Harrison & Co.; G. G. Baines, architect, 12, Guildhall Street. Warehouse, for M. Wade; H. Walters, architect, 44, Lune Street.

Prestwich.—School; C. Musker Bros., Ltd., contractors, Bingham Street, Swinton, Manchester. School; Whiteham & Ashton, contractors, 113, Foxdenton Lane, Middleton Junction, Manchester.

Richmond (SURREY).—C. of E. school, Ham; J. Douglass Mathews & Son, architects, 3, Ebury Street, S.W.1.

Romford.—Depot, for T.C.; borough surveyor.

St. Albans.—Houses, for T.C.; F. T. Negus, engineer, 38, St. Peter's Street.

Scarborough.—Additions to the Pavilion Hotel for Messrs. Laughton; Jones and Rickaby, architects, 102, Westborough, Scarborough. Houses and flats; borough engineer. Flats, William Street; A. Stephenson.

Sevenoaks. — Cinema, Westerham; A. P. Starkey, architect, 315a, Station Road, Harrow, Middlesex.

Sheffield.—Houses; Kilton Trust, Ltd. Parson Cross No. 2 School; W. George Davies, city architect, Town Hall. Tailoring works and furniture store; Sheffield and Eccleshall Co-operative Society, Ltd., Ecclesall Road.

Shipley.—Houses; A. E. Hardy, 46, Bingley Road, Heaton. Works extensions, for S. Hartley & Co.

Shrewsbury.—Pathological department and dispensary, Royal Salop Infirmary, for governors; Shayler & Dilks, architects, Dana Chambers.

Sleaford.—Houses; Jaques & Greeves.

Soham.—Cinema for W. Lund; W. French, architect and builder, Birdbrook, Halstead, Essex.

Southall.—Extensions to bakery, Uxbridge Road, for Price & Co. (Bakers), Ltd.; W. M. Hudson, architect, 9, Northumberland Avenue, E.12. Extensions to factory, Uxbridge Road, for T. Prosser Hingley, Ltd.; Bostock and Hollins, architects, 6, South Road.

Stanley (YORKS).—Houses; F. Fothergill & Son, contractors, Glen Dene, Sunny Hill, Kirkhamgate, near Wakefield.

Starcross (DEVON).—Nurses' home extension and villa for 40 patients, Royal Western Counties Institution, for Committee of Management.

Stockton-on-Tees. — Additions to St. Joseph's Church; A. Harrison, architect, 69, High Street, Stockton-on-Tees.

Stoke.—Factory; Belstaff Manufacturing Co., Ltd.

Stratford-on-Avon.—Extensions to factory; N. C. Joseph, Ltd.

Stretford. — Houses; A. Wallwork. Houses; borough engineer.

Sunderland.—Cinema at The Green; G. W. Lazenby & Co., Ltd., builders, Ferryhill, Co. Durham. Houses for J. Gibson; F. L. Carrell, architect, 32, Blandford Street, Sunderland. Alterations to stores for Marks & Spencer; G. J. Bell, architect, Whitby Street, West Hartlepool. Offices and garage for the Luxdon County Laundry; W. & T. R. Milburn, architects, 17, Fawcett Street, Sunderland. Alterations to St. Columba's School; J. Potts & Son, architects, John Street, Sunderland. Alterations to premises in Ashbrooke Road; Matkin & Hawkins, architects, Barclay's Bank Chambers, Sunderland. Alterations to the Old Mill Inn for Vaux & Son; W. & T. R. Milburn. Presbyterian Church and Sunday School; W. & T. R. Milburn. Alterations and improvements to premises for Boots, Ltd.; Stephenson & Gillis, architects, Saville Chambers, Newcastle-on-Tyne. School for the E.C.; J. W. White, builder, High Barnes Works, Sunderland.

Sutton Coldfield. — Premises for Cheshire Gibson & Co., 21, Waterloo Street, Birmingham.

Tiverton.—Isolation Hospital extensions.

Torquay. — Development, Thatcher Rock estate; Peerless Property Co. Alterations to Country House Hotel, Ellacombe Road; H. & G. Simonds, Ltd. Houses (13), York Road; H. J. Sanders. Flats, Lower Ellacombe Church Road; W. T. Milne.

Wakefield. — Shops for Wigram's Family Estates, Ltd.; Raymond J. Sargent, architect, 6, Queen Street, London, W.1.

Wallasey.—Health centre; Smith Bros. & Co. Extensions to Vaughan Road school; Henry Dodd.

Wembley.—Factory; Revvo Castor Co.

Whitby.—Redevelopment of the Council's property; J. W. Hays, architect, Central Chambers, Wingate, Co. Durham.

Whittlesey.—Houses, Drybread Road; U.D.C. surveyor.

Wick.—Houses, for T.C.; Scottish Special Housing Association, Ltd.

Wolverhampton. — Congregational church; W. B. and F. T. Archer, builder, Rookery Road, Handsworth, Birmingham.

Wootton (I.O.W.).—Development of Fernhill estate, for Fernhill Estates, Ltd.; S. W. Wendes, architect.

Wrexham.—Houses; borough surveyor, 1, Grosvenor Road.

York.—School, Burton Stone Lane, and alterations to Knavemire and Tang Hall schools; Education Committee. Extensions to Archbishop Holgate's grammar school; governors. Senior school; W. Birch & Sons, Ltd. Shops and houses; W. Thomlinson. Houses; J. N. Dunn.

I.E.S. and Emergency Lighting

THE Joint Committee of the Home Office A.R.P. Department and the Illuminating Engineering Society has seven sub-centres at work on specific problems connected with A.R.P. lighting. The latter include methods of control, design of fittings, furnishing low external illumination (0.002 ft.-candle), light locks for shop entrances, comparative advantages of white and coloured light and the study of fluorescent and phosphorescent materials.

The Society has so far reported on the first three topics and our issues of September 1st and 8th contained particulars of the two British Standard Specifications BS/ARP 15 (light locks) and BS/ARP 16 (low-intensity illumination) that have been issued as a result. The latter will probably form one of a series dealing with special fittings. The work has been carried through with great speed at the request of the Government.

New problems are continually put before the Society, as in the present crisis the scientific control of light assumes greater importance than ever. In its task, the Society is already drawing on the services of a considerable number of its members and will be glad to hear from others willing to devote themselves to this special work.